

HISTORY OF MEDICINE

History of Medicine

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PUBLISHER'S NOTE

THE Publisher regrets that it is not yet possible to complete the English edition of Neuburger's *History of Medicine*. He has, however, in view of repeated enquiries for the book, thought it well to issue the present instalment without further delay. The remaining parts will follow as and when the German original is published.

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HISTORY OF MEDICINE

MEDICINE IN THE EARLY MIDDLE AGES

VIEWED from the standpoint of evolution as a whole the goal which mediæval medicine sought to attain was the collation and elaboration of ancient tradition. Owing to unfavourable influences the West required far longer time for the attainment of this end than did Byzantium or the Islamic nations.

Occidental medical art, which had shown signs of deterioration and decadence even in the later centuries of Imperial Rome, dragged out its existence through more than five hundred years of the Middle Ages before manifesting any tendency towards emancipation from the bondage of this intellectual stagnation ; it attained to the dignity of a science only at that later epoch when the pre-eminence of the Arabs had begun to fail.

Western medicine in the early Middle Ages is, strictly speaking, hardly a subject for the historian of science who would present a coherent picture of progressive events—at the utmost side-lights can be thrown upon medical conditions and literature, in as far as the very scanty information at our disposal makes this possible. Inadequacy of scientific principles, total stagnation of investigation, practice devoid of any lofty outlook, stereotyped and primitive, these are the characteristics of this era's healing art, an art which in its manifestations is almost reminiscent of the earliest stages of medical evolution. Gloomy as is the impression left upon the mind, the close connection of medicine with civilisation as a whole and its historic destiny come unmistakably to the fore, and its fate in this mournful period is bound up more intimately than usual with the spirit of the times.

In order to bring the degradation of medical art into relationship with the character of the epoch, no comprehensive description of the historical background is necessary, it will suffice briefly to indicate the most salient events of general importance.

The foundation of the Germanic states upon the ruins of the *orbis Romanus*, which played so important a part in the rejuvenescence of the nations of Europe, was associated with the sacrifice of countless lives, with the destruction of treasures of art and letters, with the devastation of wide

areas and the sack of many towns, with the annihilation of property, with the decay of the higher social and economic life. The decline of the Western Roman Empire, ushered in by a process of disintegration extending over centuries, was remotely, if not immediately, responsible for the collapse of a long moribund but yet considerable culture. The assimilation of this civilisation by the conquering Germanic nations was at first hindered by their heterogeneous impulses, tendencies and traditions, by the dissimilarities in speech and the lack of that more refined sensibility which can only follow upon the labours of many generations. It was, too, only after a long transition period filled with strife, with the confusion of racial intermingling, of political distraction, of social dislocation, that a sufficiently stable condition of affairs was re-established in the Germano-Roman world to make a renaissance of civilisation possible. In the barren centuries, when antiquity threatened completely to decay, whilst it was as yet uncertain what the future might bring forth, the Church alone, unshaken by all changes, stood as a bulwark against the flowing tide of racial migration and preserved a link with the past. She planted her banner upon the rampart of antiquity and rescued the arts of peace from total annihilation. Monasticism, in particular, has eternally to its credit that it afforded to culture a sanctuary in the midst of barbarism and with far-reaching results sowed the seeds of civilisation simultaneously with those of the healing art where the Roman legions had never penetrated. *Ite et docete omnes gentes* was translated into action. The elements of culture, mostly inherited from later Roman times, were, however, scanty, and their further development served only formal ends and was along such lines as the trammels of belief permitted. The scientific life of the early Middle Ages, of which the dim religious light of the Church and the study-lamp of the poring monk were almost the sole illumination, was on the whole a colourless one, not rising beyond mere reproduction, bringing forth no luscious fruit, for it is only where bounteous springs flow and where it is nurtured for its own sake that genuine science can flourish.

Taking the point of view that we have here to deal with a new beginning, with the cultural development of fresh nationalities which, after an evolution extending over centuries, for the first time found themselves capable of assimilating the achievement of the Graeco-Oriental intellect, many phenomena appear in a clearer light, not only poetic and artistic impulses, but also leanings toward science. If, on the other hand, we trace, as we are doing, the course of civilisation as a whole, a comparison forces itself upon us, if not with antiquity, yet with contemporary Oriental conditions, creating the impression of a retrogressive metamorphosis.

In a comparison of the conditions obtaining in the West during the early Middle Ages with those in the East after the victorious campaigns of the Arabs, a number of factors have to be taken into consideration which exercised a considerable influence in determining the crude differences between the cultural development of East and West, the following amongst others.

The Western Roman countries which, from the third century onwards, lost more and more the borrowed brilliance of Hellenism, even before their subjection to the dominion of the Germanic races, hardly stood at the same high level as Syria, Persia and Egypt at the time of the Arab conquest; their devastation by depopulating wars and pestilence was more terrible than the later despoiling of the East. Whereas in the latter many large towns sprang up, and therewith centres of learning, trade and industry came into being, whose products were distributed by a commerce embracing three continents, in the West numerous cities were given up to destruction or sank into insignificance.

In place of the established and highly developed financial system of the East, with its influence upon civilisation, the Germanic conquest brought in its train a degraded and primitive system of exchange, life took on a more bucolic character, the predilection in favour of agriculture, the stagnation in trade, the decline of industry, the unprofitable traffic, the increase of poverty, all reacted unfavourably upon the more refined modes of life. Just as the original political unity of the Califate and its proximity to Byzantium favoured civilisation, so did the division of the Germanic dominion into numerous separate entities with resultant isolation long constitute an obstacle to progress, although the way was thereby actually paved for later fruitful competition amongst the European nations.

The rapid rise and astonishingly wide dissemination of scientific activity under the "Arabs" is, apart from the above-mentioned predisposing causes, chiefly traceable to the fact that Greek literature was early and freely translated into the living language of the Koran, which was that of government and daily life, and thus to their great advantage was made accessible by means of libraries and schools to large numbers of the active-minded middle class. In the world of Islam it was the conquerors who impressed upon the conquered the stamp of Arabic nationality through their own language and religion, and who exercised a controlling influence upon the assimilated civilisation as well as upon that which had been self-evolved in freedom. In the Christian West, on the contrary, the Germanic conquerors, not having been originally united in the bonds of national sentiment and religion, were compelled to submit to a foreign civilisation, the Latin-Christian, which was almost exclusively in the hands of the clergy. This body occupied quite a special position in the State, was long recruited from the Roman populace, and was the means of ensuring to the Latin language, on account of its hallowed association with ecclesiastical literature and the influence of the cult upon national unity, ascendancy over the vernacular tongue as the method of expression of all higher intellectual activity. The treasures of knowledge existing in the Latin language, although only a very restricted portion of ancient culture, could not be directly conveyed in that medium to the Germanic races—whose need and capacity for education may be admitted. Civic impulses failing, all the vital energy preserved by ancient civilisation was concentrated upon the Church. An originally inadequate groundwork, not incomparable with that of the Arabs, enclosed within the rigid bounds of a dead tongue, checked in its free development by an irrevocable predestination, receiving no extraneous traditions or quickening ferment—how were vital creations to arise from this?

Medicine also, more and more hampered by the unfavourable external conditions obtaining in its educational establishments, threatened even in its very existence as a profession by the ominous change in economic conditions and modes of life, came increasingly under the sway of the Church—although it had long been a sphere of action for religious zeal and active Christian philanthropy. Priests and ascetics became physicians rather than philosophers and men of the world. The epoch is spoken of as one of monastic medicine—a description which, as will be shown, requires considerable qualification. Medical science as such naturally played under this guidance only a subordinate part, not only in contrast with ecclesiastical,

but even with other profane branches of knowledge ; it eked out an exiguous living upon the scanty remnants from late Roman times and passed into the fog of mysticism and into the doubtful company of frankly credulous, popular empiricism. A shallow pool is quickly fouled.

The dominant influence in early mediæval medicine was decidedly that of the Church, but it would, nevertheless, be a mistake to conclude that the preponderance of clericalism and monasticism which stands out in such bold relief had brought about the complete disappearance of the lay practitioner. A survey of the conditions also emphasises the fact that the decay of medicine and antique culture, as a whole, did not keep pace with the decline of the Roman world-dominion—epochs in civilisation are not sharply delimited, they are the results of gradual evolution and their boundaries are fluctuating : under Germanic dominion, too, Rome continued her individual existence for a while, and many schools of learning, founded in the Imperial era, temporarily kept up a shadowy existence.

The individual countries of the Western world at the beginning of the Middle Ages present pictures by no means identical—it was only later that barbarism had, to some extent, a levelling effect, and the original differences depended upon the varying effect of Roman civilisation in driving deep furrows, in merely ploughing sands or in leaving the soil unbroken.

In the absence of detailed information the influence of these variations upon medical affairs can only be indicated in outline.

The medical profession and medical education were, in early mediæval times, best cared for in Italy, particularly so long as the dominion of the Ostrogoths endured, since these understood how to combine preservation of their national individuality with high esteem for Roman culture, and thus, instead of laying rude hands upon the mechanism of public life, they left this untouched.

Under Theodoric the Great, Italy, which in the fifth century had undergone so severe a visitation, passed through an epoch of ten years' peace, and enjoyed not only material prosperity and the most jealous consideration for Roman tradition in the administration of government, but also benefited from the promotion of art and science. It suffices, in the latter respect, to mention the names of a Cassiodorus, a Boëthius and an Ennodius. Theodoric, the noblest stranger who ever held sway over Italy, wished to be rather a protector of the Romans than a conqueror, for which reason he left them in possession of their laws and institutions, even although deriving his powers from the Goths, who alone represented the warlike element, and to whom, following the ancient method of division, a third of the land was apportioned. Both nations, the Romans and the Aryan Goths, lived, according to their native customs, in proximity with one another, without attempting any precipitate amalgamation, rather was there a gradual reconciliation of opposites ; unfortunately, even in the later years of Theodoric's reign, this always lukewarm relationship cooled, chiefly on account of religious differences, and still further under his successors through mutual jealousies fostered from the Byzantine court. The national dualism in the kingdom finally brought about the downfall of the Gothic dominion, and therewith the dawn of the most distressful period for Italy.

The Goths, the first of the Germanic races to be Christianised, in the heyday of Aryanism, and owing much to their long contact with Eastern Roman civilisation, could hardly have been called barbarians at the time of their advent in Italy. They possessed a language of comparatively high development, and many of them evinced some inclination towards the scientific studies which the Romans were once more pursuing with avidity, although the nation as a whole saw in a learned upbringing a danger to military efficiency. It is known that Theodoric's talented daughter Amalaswintha spoke Greek with Greeks, Latin with Romans and had her son Athalaric instructed in Roman arts.

With such forbearance towards existing conditions it can readily be understood that the Roman medical polity, as it had been developed in later Imperial times, would have remained intact; luckily, however, we do not need to rely upon mere conjectures, since there has been handed down to us a pompously styled ordination upon the rights and duties of the Comes Archiattrorum, probably emanating from Theodoric, whereby the existence of an educated and organised medical fraternity is proved.

Just as the scholastic nurture of literary studies, of grammar, rhetoric, jurisprudence, etc., was perpetuated, so we can with certainty assume the persistence of medical education in the fashion of decadent late Roman times.

The incentive to medical literary activity was almost entirely to be found in the demand for Latin translations (verbal or condensed), or more or less free rearrangements or compilations of such individual works in ancient literature as were valuable from a practical point of view. This method, which had already been adopted in the latest phases of Roman medicine (Caelius Aurelianus, Cassius Felix), on account of declining familiarity with Greek speech and growing inclination towards compendious compilation, was even more necessary at this time in the interests of the Germanic elements in the profession. The literary material which thus came into existence—later naturally amplified—occupied a position in Occidental medicine inherently analogous with the translations of Aristotelian and other ancient writers by Boëthius.

The era of the Ostrogoths has bequeathed to us one work at least possessing a trace of originality, the Dietetics of Anthimus, written in barbaric Latin, and constituting a peculiar memorial of the cultural influences emanating from Italy.

Anthimus, a Greek physician, expelled from Byzantium, who journeyed to Italy with Theodoric the Great, and who lived for a while at the court of the Frankish king, Theuderic (511–534), as emissary of the Ostrogoths, published in barbarous Latin a dietetic treatise in the form of an epistle: *Epistula Anthemi viri inlustris comitis et legatarii ad gloriosissimum Theudericum regem Francorum de observatione ciborum*. The little work is mainly based on pre-existing achievements, but the individual experience of Anthimus amongst Goths and Franks is also included. The introduction contains the assertion that a rational dietary constitutes the foundation of health and is a preventive of disease; food should be easy of digestion; moderation in eating and drinking should be aimed at, and even upon journeys personal preparation of food should not be neglected. The admission that nations exist which

maintain health, in spite of the consumption of raw meat, is qualified by pointing out that the harmfulness is compensated partly by the small quantity and partly by the uniformity of the diet. Anthimus describes some hundred articles of food and drink, and in many places goes exhaustively into details, as, for instance, when he appraises the individual parts of swine, oxen, etc., according to their digestibility and nourishing value, and carefully describes their appropriate modes of preparation. He gives warning amongst other things against consumption of pickled meat, bacon rind, pigs' kidneys, pigeons (because these often eat hellebore), hard-boiled eggs and old cheese, most mushrooms, fish that has been kept, and oysters. The therapeutic as well as the dietetic use of certain articles of food and beverages is mentioned: thus bacon is employed against intestinal parasites; partridge flesh in dysentery; barley-meal porridge, diluted with tepid water, in fever; rice in goats' milk in dysentery; fresh cows', goats' or ewes' milk, fresh butter in commencing phthisis; almond emulsion or figs in catarrh and angina, etc.

Anthimus is the last Western lay author we hear of for a long time, following him the conduct of literary affairs remained for centuries in the hands of the clergy or monks.

The gradual transference of scientific study to ecclesiastical circles—since what is said of medicine holds equally true for other subjects—pre-supposed the decay of ancient institutions, the disappearance of educational establishments which had existed from antiquity. This process of disintegration was completed during the course of the sixth century, in that terrible era, when from the Alps to the southernmost point of Italy havoc and devastation, famine and misery, savagery and brutality were spread far and wide by the long-drawn fight between Ostrogoths and Byzantines, by the invasion and occupation by the Lombards, and most of all by the pestilences which, accompanied by terrifying natural phenomena, followed upon the murderous wars. It is only too readily comprehensible that the fearful afflictions of this period, so rich in horrifying occurrences, should have checked the pursuit of science, undermined belief in it and reduced the schools of profane learning to the vanishing point, whilst on the other hand they awakened religious zeal and extravagant asceticism. One can equally understand that the Latin populace, oppressed by the undisciplined Lombards, who rode roughshod over foreign rights and liberties, and left in the lurch or inefficiently protected by the Byzantines, soon sought in the Roman Church their only solace. The latter, seeking territorial aggrandisement, was able through the disruption of Italy to take a strong line in practical politics and, surrounded by the halo of the Eternal City, effectually to safeguard the independence and civilisation of the West against unfriendly interference and to manifest a most beneficent activity as the champion of the persecuted. Deprived of almost every other aid, science, to maintain its existence, was forced to betake itself to the shelter of the Church and to seek refuge in monastic seclusion from an unsympathetic world—a course which had been adopted by no less a man than Cassiodorus, “the last

Roman". Conscious of her associations with the past, more and more adopting the rôle of instructress of the West, overcoming her dislike to the heathen spirit of ancient culture, the Church, amidst the chaotic confusion reigning, undertook the responsible task of preserving the heritage of literature through monkish industry—without, however, combating the superstition which flourished so luxuriantly in this unenlightened era.

Both are clearly reflected in medicine, in which Christianity had early assumed a somewhat ambiguous position. Superstition, under ecclesiastical and monastic favour, went peaceably hand in hand with a highly creditable zeal for preservation of the remains of ancient medical literature and the traditions of rational practice.

The custom of bringing the sick into the churches for help, in order that the priests might sprinkle them with holy water and pray over them, became universally prevalent in the first centuries of the Middle Ages. Those churches, in particular, had great powers of attraction in which the bones of saints reposed.

Belief in the miraculous healing power of saints, relics, etc., naturally increased immensely at the time of plagues, in which the sixth century abounded, since fear conjured up terrifying phantoms and unbalanced reasoned judgement. The more medical art proved itself actually powerless, the more was salvation looked for from supernatural aid.

The study of medical authors and the rescue of medical writings from complete destruction was undertaken by the order of St. Benedict, founded in the time of the Ostrogoths, after Cassiodorus had directed the industry of the monks towards the systematic nurture of science and had indicated the high value to the clergy of ancient literature. The motive hereto was the more obvious, since from the commencement the order had, through the precept enjoining care of the sick, been brought into close contact with the art of healing—albeit not without a strong theurgical bent in practice (cure through prayer, exorcism).

In the same year (529) that Justinian closed for ever the school of philosophy in Athens, Benedict of Nursia founded the celebrated original monastery of his order upon the site of an ancient temple of Apollo on a lonely, precipitous mountain in Campania, Monte Cassino. The *Regula St. Benedicti*, which probably still exists in its original form, whereby the monastic life was deprived of its Oriental contemplativeness and exaltation in order to make it from a practical moral point of view more in keeping with Occidental conditions—dialectics playing no small part therein—contains indeed a recommendation in favour of daily handiwork and intellectual reading, but of any real scientific course of study there is no word. Scientific work was only later included by the Benedictines in their rules, or rather in their practice, when an amalgamation took place of the monasteries founded by Cassiodorus with those of St. Benedict. Then for the first time the Benedictines became the Nestorians of the West. Cassiodorus (480–575), who after many years of political activity under Theodoric and his successors turned monk in order to dedicate himself to God and science for the rest of his life, retreated in 538 to a monastery founded by himself. Setting the fashion to posterity, Cassiodorus was the first to make the monastery, not only a house of asceticism, but also an asylum of science.

St. Benedict made the care of the sick the peculiar care of his followers. *Infirmorum cura*

ante omnia adhibenda est, ut sicut re vera Christo, ita eis serviatur—and entrusted it principally to the hands of the “Cellerarius”: he brought about also, as is reported, numerous miraculous cures. Cassiodorus, however, went much further, recommending the study of medicine to the monks and giving them detailed advice as to the writers of antiquity who should be utilised as a foundation for their principles.

In his condensed encyclopædia *Institutiones divinarum et saecularium lectionum (litterarum)*, which was intended to present the monastic orders with a review of the literature and knowledge of the profane sciences most adapted to their needs, and which actually exercised great influence upon mediæval study, Cassiodorus thus addresses the monks: “Learn to know the properties of herbs and the blending of drugs, but set all your hopes upon the Lord, who preserves life without end. If the language of the Greeks is unknown to you, you have the herb-book of Dioscorides, who has described and depicted the herbs of the field with astonishing accuracy. Afterwards read Hippocrates and Galen in Latin translation, *i.e.* the Therapeutics of the latter, which he has dedicated to the philosopher Glaucon and the work of an unknown author, which, as would appear from investigation, is compiled from several writers. Study further the Medicine of Aurelius Caelius, the Hippocratic book upon herbs and healing methods, as well as a variety of other treatises upon the healing art which I have brought together in my library and have bequeathed to you.”

The advice of Cassiodorus was seed falling on most fruitful soil—the works or translations recommended by him are still in part extant in numerous manuscripts. Particularly in the original Benedictine monastery, in the healthily situated Monte Cassino, where doubtless from earliest times the sick were tended, in association with the usual scholastic labours, were undertaken copying, translation, compilation and verbal exegesis of the older authors; wider dissemination followed gradually by means of the network of daughter monasteries. The knowledge thus attained was subsequently turned to practical account and led the monks—and as a sequence also the non-monastic clergy—to make increased use of healing herbs and medicaments, the efficacy of which had become known from the literature, in addition to psychic methods in their treatment of the sick. An early memorial of this important change exists in the little therapeutic compendium, “*Commentarium medicinale*”, a didactic poem by the Archbishop Benedictus Crispus of Milan, who lived at the time of the Lombard king, Aribert II., and stood in close relationship with the Benedictines.

Monks and clerical physicians, however, only filled the widest of the gaps which, from the time of the decline and fall of the lay educational institutions, made their appearance in medical learning and in the medical profession; they undertook that part of the state care of the poor which at

one time fell to the *archiatri populares*. Apart from crude empirics, however, Italy, in contrast with all other countries, has at no time entirely lacked lay practitioners of good standing and therewith private instruction.¹ This doubtless bears some relation to the fact that there, in the midst of the ruins of a great past, the old traditions never became completely extinct, but glowed under the ashes and were from time to time fanned into a fresh flame, and that some remnant of antique heathen culture was preserved as an echo from the ancient schools of rhetoric, independent of and even in opposition to the Church, awaiting better and quieter days.

The Lombards were unable permanently to withstand the allurements of more advanced civilisation, and as assimilation was brought about between them and the Roman populace, leading even to civil equality and religious and national amalgamation (Catholicism and Romanism established from the second half of the seventh century onwards), so did agriculture, trade and industry begin to flourish, whilst new life was infused into art and science. Whereas in Rome itself, with an exception in favour of religious music, a decline in culture had set in, already manifested in the barbarously decadent Latin tongue, in Lucca, Milan, Pavia, Benevento and Salerno, grammar, dialectics, rhetoric, historiography and jurisprudence received a fresh impulse; in the midst of the tumult of political changes which Italy was undergoing, artists and savants were honoured at the courts, and Lombard princes extended their favours to literary studies and proved themselves friends to education. Especial distinction was attained by the descendants of the terrible companions of Alboin, the Lombards, as exemplified in the person of Paul the Deacon, the talented historiographer of his nation who, brought up at the court of Ratchis, had as pupil Adelberga, the gifted daughter of Desiderius, whose husband, Arichis, Duke of Salerno, he described as the most cultured prince of his time. Within the sphere of the renaissance of lay education, an important stimulus to which was imparted by Byzantine influences in the Exarchate and in southern Italy, medicine was prevented from remaining entirely in monkish hands, as is shown, for instance, by eighth-century records from Lucca and Pistoia, which make mention of Lombard lay physicians, and by a Milanese manuscript according to which public dissertations upon Hippocrates and Galen were given in Ravenna in the eighth century. As with awakening culture in general, medicine in Italy sprang from two main sources, a clerical and a non-clerical, which, in their subsequent courses, were gradually to approach one

¹ The fact may here be mentioned that in the second half of the sixth century Alexander of Tralleis practised in Rome and may even have been a teacher; further, that Pope Gregory invited the Archbishop of Ravenna, Marianus, to Rome in order to undergo a medical course of treatment for a malady of the chest.

another. Up to the tenth century only manuscripts of clerical origin have come down to us, *e.g.*, the medical works of the learned abbot of Monte Cassino, Bertharius (857-884), *De innumeris remediorum utilitatibus* and *De innumeris morbis*, which furnish evidence of the literary and practical zeal of the monks and of their medical skill. The entire later development, however, the high degree of which is for the first time historically revealed, makes it highly probable that in lay circles even at that time a concentration of medical knowledge occurred (*summa medicinae*), and that medical instruction was placed upon a methodical basis whereby a guild-like union of the representatives of the medical profession was at least initiated.

The fountain-head of medical lore consisted of the late Roman authors and more or less free Latin translations from works of Greek or early Byzantine literature. As far as the first are concerned, it was less Caelius Aurelianus himself than annotated extracts from his works that were circulated, particularly the "Aurelius" and "Esculapius", dating from the sixth or seventh century.

The groundwork was further elaborated, various compilations made from it, and collated in encyclopædias; for many centuries, apart from mere copying, this was the end of all literary activity, wherein the tendency to the evolution of a *Summa Medicinae* appears more and more distinctly.

Before following any further the traces of the healing art in Italy, we must glance at the medical conditions obtaining in other civilised countries in early mediæval times. Although we have only scant information at our disposal, nevertheless the fundamental fact stands out clearly, that the Transalpine clergy and monks, in medicine as in culture in general, occupied a far more dominant position than in Italy, and indeed long held undisputed sway.

In Spain, which, from the last decades of the fifth century onwards, groaned under the tyranny of the Visigoths, the schools of the Imperial era degenerated earlier than in other once Roman provinces, *e.g.* Cordova, and with them also the medical status, the profession declining to the level of a trade. The small esteem in which it was held is shown by the legal enactments of the Visigoths, which, evidencing deepest mistrust, not only throw light upon the conditions of payment, but also demonstrate the method of instruction (personal tuition by an experienced master).¹

¹ The Germanic national laws, formerly known in contempt as "*leges barbarorum*", transcribed in Latin, chiefly in the period from the sixth to the ninth centuries, can be traced back to ancient traditions, although showing marked Roman influence. The written version of the laws of the Visigoths, begun as early as the end of the fifth century, also exercised considerable influence upon other Germanic nations (Burgundians, Franks, etc.). Of particular medical interest are the enactments upon punishments for injuries and other crimes against the person, many side-lights being incidentally thrown upon the social position of physicians. Limitations of medical activity, such

The physician upon undertaking treatment was obliged to conclude an agreement concerning remuneration and provide security. For different cures there were distinct tariffs, *e.g.* 5 solidi for cataract extraction. If the patient died the physician had no title to an honorarium, but could withdraw his security without hindrance. For technical errors the physician had to pay a fine; *e.g.* for damage for unskilful venesection, 150 solidi. If death of the patient was brought about by the treatment, the physician, if the patient were a servant, was bound to provide another; if, on the contrary, he were a freeman, the physician laid himself open to arbitrary punishment from the relatives. Upon free women the physician could only perform venesection in the presence of a relative, even in cases of urgent danger, under pain of a fine of 10 solidi; neighbours, maids, or slaves must be present, for otherwise such occasions might give rise to immoral abuses. Such draconic enactments naturally hindered medical action, for none but itinerant quacks could escape the criminal dangers threatening treatment.

The earliest hint of clerical participation in medicine is found in the ostensible performance of Caesarean section upon a pregnant woman by Bishop Paul of Merida, and we learn in addition that Bishop Masona of Merida built a large hospital there in 580. It is extremely probable that herein the influence of the Nestorians' skill in medicine was making itself felt. Following upon the conversion of the Aryan Visigoths to Catholicism (586), monasticism and ecclesiastical instruction received a considerable impetus. We may assume definitely that institutions and monasteries were provided with several physicians. From one of the ecclesiastical schools came the celebrated Bishop Isidore of Seville (Isidorus Hispalensis), one of the greatest educationists of the Middle Ages, who, undoubtedly following upon Cassiodorus but far excelling him, collated all that was of value from ancient literature, and through his "*Etymologiae*" in twenty books, a most comprehensive encyclopædia, long exercised an important influence upon the art of healing—in so far as the clergy dealt with the subject.

Isidorus Hispalensis, Bishop of Seville (570–636), the most learned man of his age, laboured hard in the interests of science, and through his numerous writings (upon theology, philosophy, philology and natural science) became one of the most influential teachers of the Middle Ages. His principal work is of importance to medicine—*Originum s. Etymologiarum libri XX.*—a Latin encyclopædia comprising all branches of science, inspired, often verbally, by some eighty authors. The fourth book, chiefly in adherence to Caelius Aurelianus, affords a survey of the entire range of medicine, the chief rôle being played by the derivation of Graeco-Latin terminology, matters of fact being barely touched upon. Isidorus places medicine on a level with philosophy, and emphasises the many-sided education essential to the physician. The chief actions and methods of exhibition of numerous remedies are given, and superficial descriptions of the modes of employment of a few instruments and medical utensils.

The conditions of medicine under the Franks in Merovingian times were similar, but subsequently even more deplorable. The scanty information

as are found amongst the Visigoths, are not known in the legal systems of other nations; in these medical evidence even plays an important part in determining decisions. In the national laws of the Visigoths and other Germanic nations criminal abortion was severely punished—herein the influence of the Church made itself decisively felt.

(from Gregory of Tours and Fredegarius) indicates that the office of archiater¹ was continued, being held partly by strangers (Greeks), partly by natives, but we learn little or nothing concerning the education of the Frankish physicians.

Isolated pages in the writings of Gregory imply experience in surgical matters. The slight esteem in which practitioners of medicine were held is shown by the hard treatment occasionally meted out even to the royal body physicians.² The people placed their confidence in surgeons with a certain routine education, but more especially in the miraculous power of saints and in ecclesiastical theurgy, which, through the terrifying influence of devastating pestilences (plague, dysentery, smallpox), exceeded the bounds of what, under early mediæval conditions, might have been expected, and assumed the most fantastic shapes; charlatans of every description, too, in the presence of crass ignorance and boundless credulity, flourished amazingly.

Ecclesiastical medical miracles of Merovingian times are well reported in the pages of the Frankish historian, Bishop Gregory of Tours (538-593), in his history of the Franks and in his books on the miracles of the saints.

Frankish Christianity, as yet crude and unenlightened, was permeated with popular superstition and offered the most favourable soil for an overgrowth of theurgy, which was particularly connected with those churches in which reposed the bones of saints. Here were performed countless miracles upon the lame, halt, blind, possessed, etc. Amongst the forms of theurgical therapy were not only healing by prayer and exorcism, contact with sacred relics, tombstones, etc., but so far did belief in the inexhaustible emanation of miraculous power go that dust from tombstones, wax dropped from votive candles, ash from their wicks, fringes of palls, oil of church lamps, etc., were employed as amulets or as internal remedies. The procedure, in which the sick passed the night in church in the hope that the saint would appear to them and relieve them of their ailments, is reminiscent of the temple-sleep in the Asclepios sanctuaries. In times of pestilence the crowds of sick became enormous. On the part of the priests occasional hygienic measures were associated with theurgical therapeutics (*e.g.*, interdiction of spirituous liquors, meat-eating, etc.).

The one bright spot is the erection of hospices, in which the sick were also tended. The course of the history of the Merovingian period towards the end of the sixth century—it is nothing but a succession of murderous

¹ This bears relation to the fact that the Franks adopted many Roman institutions. Clovis and the sixth-century Merovingians displayed interest in Roman civilisation. At their court the flower of the nobility was educated on the Roman pattern in a *schola palatina*; Romans acted as tutors, envoys, even as rhetoricians and poets. It was not until the end of the sixth century that the complete downfall of culture took place in the Frankish kingdom, proceeding unchecked to the profoundest barbarism. Whilst Childebert II., like many of his predecessors, who even practised versification, was by no means unlearned, the seventh-century Merovingians hardly knew how to affix their names to documents.

² Marileif, the archiater of King Chilperic, was scourged, robbed of his property and handed over to the Church as a serf. Austrichildis, wife of king Guntram, seized with a plague which devastated the entire kingdom in 580, and feeling her death approaching, demanded of her husband that her two physicians, Nicolaus and Donatus, as a punishment for the inefficacy of their remedies, should be beheaded. The dying woman's wish was faithfully carried out, that the queen should not enter the realm of death alone.

civil wars, treason and treachery, vice and savagery—is ample proof of the fact that the existence of any scientific healing art on such a soil was an impossibility, the more so since science completely lacked the support of a culture-loving clergy. Clerics and monks in the Frankish church had succumbed to immorality and barbarism and had sunk into ignorance—any improvement of the entirely decayed cultural conditions could only be initiated by a powerful external influence, and could only be carried through by a ruler's iron will.

Better conditions did not obtain in the Frankish kingdom until the shadowy dominion of the last Merovingians was replaced by the strong rule of the Carolingians, and until the clergy were subjected to a stricter discipline. From the ninth century onwards the cultural advance is unmistakable. The way was paved for this by the influence of Irish and Anglo-Saxon monks, who, making pilgrimages to the continent, aroused religious enthusiasm on every side and carried the Gospel into the most remote parts, whilst they spread abroad germs of civilisation from the newly founded monasteries.

It appears a wonderful dispensation of Providence that, during the terrible devastations of the sixth to eighth centuries, in a truly forlorn age of general decay of civilisation, the heirlooms from antiquity should have been hidden in Ireland, the *Ultima Thule* of Christianity, converted mainly by St. Patrick in the fifth century and never invaded by the Roman arms. There (later also in Scotland), from the second half of the fifth century onwards, far removed from the tumult of camps, diligent and strictly ascetic monks practised industries, arts and sciences; in the monasteries, not only ecclesiastical works but also many of the writings of antiquity were collated, copied, studied, and applied to purposes of instruction; there alone was preserved a knowledge of the Greek language, at a time when it began to die out in Italy. Bangor and Hy (or Iona) were centres not only of religious fervour, but also of learning and culture. The Celtic monks had a nomadic instinct in their blood; pilgrimage was to them a pious duty; as early as the sixth century the most zealous of them, heedless of privations or dangers, left the Emerald Isle and Scotland for the land of the Franks, for Burgundy, travelling through Germany, Bavaria, Thuringia, etc., penetrating even into Upper Italy, exhorting everywhere to repentance and Christian virtue. As at home, so abroad, they pursued their learned avocations, founded many monastic libraries—even now many manuscripts bear witness to this in the pointed handwriting peculiar to the Erse—and sought, through apt pupils, to spread abroad knowledge and useful arts. It will suffice to mention here that Bobbio (near Padua) was a foundation of the great Irish missionary St. Columba the younger, and that subsequently the celebrated monastery of St. Gall was established by his companion St. Gall.

Whilst later the Benedictines on the continent frequently trod in the footsteps of the Erse, in England the endeavours of both ran parallel. Here the Gospel had been preached amongst the British people even in Roman times, but with their destruction or displacement by Picts, Scots, Angles, Saxons and Jutes about the middle of the fifth century, Christianity sank to a very low ebb. Towards the end of the sixth century there was a clash of missionary activity between the Celtic Church of Ireland and Rome under Gregory the Great in an attempt to convert the heathen Anglo-Saxons, not without mutual rivalry and even enmity. It was competition with the Irish envoys which compelled Rome to put forth its best endeavours, and which stimulated the Anglo-Saxon-Roman clergy also to vie with their rivals in the field of scientific endeavour. Pope Gregory had lavished much care upon books, his envoy

Augustine also working to this end, but Anglo-Saxon ecclesiastics and monks, of the Benedictine order, had long to seek the finishing touch to their education in Irish monasteries. The influence of the learned Archbishop of Canterbury, the Greek Theodore of Tarsus, was a lasting one, founding as he did, in association with the abbot Hadrian, schools on the Italian pattern in association both with churches and monasteries, whereby the classical education of the ecclesiastics was in so far widened that for two generations there were not lacking men who spoke Greek as their mother tongue.

From their frequent pilgrimages to Rome, bishops, abbots, monks, as well as princes and well-to-do laymen, brought home manuscripts, and, by means of multifold copying, swelled the treasures of the libraries in cathedral and cloister schools, particularly in Kent, Malmesbury, York, Wearmouth and Yarrow. In the eighth century, the Anglo-Saxon clergy surpassed those of all other countries in knowledge; eager students flocked from every quarter, whilst the growing feeling for culture made itself felt, not only in strictly ecclesiastical subjects, but also in those dealing with profane science. Like the Irish and Scotch, the Anglo-Saxon monks went out into the world as heralds of the faith; the greatest of these was Boniface, who in his journeys through Germany founded in different places churches, monasteries and schools, and not only won new ground without ceasing for Christianity, but brought about the subjection of the Frankish Church to Papal rule; he found a martyr's death amongst the heathen Frisians.

It is certain that with the practical knowledge nurtured and spread by the Irish, Scotch and Anglo-Saxon Benedictines was included that of medicine, for from statements by Columba, from correspondence of Boniface, but more particularly from the writings of the Venerable Bede (674-735), we gather that the monks of Ireland and England did not neglect medicine in their studies, that they were at pains to preserve the technical literature in manuscript, and applied the knowledge thus attained at the bedside.

The Venerable Bede, abbot of the monastery of Wearmouth and one of the most learned men of his day, was the connecting link between the last years of the Roman-Christian era and the commencing intellectual life of the Christian Germanic races. His voluminous works, which bear evidence of comprehensive erudition, have some bearing upon medicine. Thus the celebrated *Historia ecclesiastica gentis Anglorum* contains descriptions of epidemics, gives information concerning miracles, particularly those of the Bishop St. John of Beverley (amongst them being some which are clearly susceptible of rational explanation; e.g., the extremely interesting incident of a cure of a case of aphasia by means of methodical exercises), and throws instructive side-lights upon the medical art of the Anglo-Saxon period, in which, in addition to skilled monks and priests (e.g. Bishop Tobias of Ross), popular physicians, leeches, plied their trade. In the *Elementa Philosophiæ*, a comprehensive encyclopædia, there is much natural science but only little physiology, and that borrowed from Aristotle. The little treatise, *De minutione sanguinis*, which bears Bede's name, is mainly a specification for the performance of phlebotomy upon certain veins, and for the favourable and unfavourable days for venesection.

However meritorious the pioneer work of the Anglo-Saxon missions may have been, their tender seedlings would probably have been uprooted in these rough times if culture had not found its protector and active promoter in the most powerful patron of mediæval times, Charlemagne. It would carry us too far to enter here into details of how the *Rector regni* and the *Rector ecclesiæ*, in pursuit of the highest aims, roused the Frankish clergy and made the foundation or restoration of numerous cathedral or

monastic schools his care throughout the entire kingdom, even to its farthest boundaries; how he made his court the centre of learning and many-sided literary endeavours; how he sought by his own example to advance education amongst the laity as well as to infuse intellectual enthusiasm in the clergy. The greatly conceived plans of Charlemagne came to fruition mainly through Alcuin (735-804). This highly gifted Anglo-Saxon was the centre of the court academy, consisting of scholars of many different nations, the soul of the admirable *schola palatina*, the founder of the monastic school of Tours, which stood as an example to the clergy of all the Frankish countries and whercin, through diligent and carefully supervised transcription, a library of valuable manuscripts was formed. To Alcuin, who disseminated the scientific traditions of the schools of York, Winchester and Canterbury upon the continent, belongs the credit of having laid stress upon mathematico-astronomical knowledge as well as upon grammatical and logical studies; possibly also medicine found a corner in his edifice of learning. At least in one of his poems, in which he jestingly describes the doings of scholars at the court, he says:

Accurrunt medici mox Hippocratica tecta,
Hic venas fundit, herbas hic miscet in olla,
Ille coquit pultes, alter sed pocula praeferit
Et tamen, o medici, cunctis impendite gratis
Ut manibus vestris adsit benedictio Christi.

In the verses, too, of the Carolingian court poet "Hibernicus exul", who praises the frescoes of the Imperial palace, special mention is made of medicine amongst the arts and sciences.

Medical instruction was at any rate regulated by Charlemagne—in the capitular of Thionville (805), *De medicinali arte, ut infantes hanc discere mittantur*, wherein attention was paid to practical instruction as well as reading of medical works and study of medical botany, as appears in Alcuin's poem. A highly creditable fact is that a capitular of 813 was directed against medical superstition and forbade the priests, under severe penalties, to employ consecrated oil for the purposes of cure or magic.

The zeal of the emperor for endowing Christendom with a fitting civilisation was crowned with success, leading to the dawn of a new era which endured beyond the death of its inaugurator.¹

Through the agency of the pupils of the court school and the monastery of

¹ This holds true only of ecclesiastical circles, for very shortly after Charlemagne's death the laity lost interest in scientific endeavour, the *schola palatina* had forfeited its far-reaching importance by the time of St. Louis, and popular education in particular stagnated. From 817 onwards the strictly monastic schools (*schola interior*) were replaced by extern schools (*schola exterior*) intended for lay pupils.

Tours, after the ninth century education and scientific activity in the chapter- and monastery-schools made satisfactory progress, and in spite of the chaos following the dissensions in the Carolingian dynasty and the division of the kingdom, in spite of the terrible distress from foreign enemies, there arose a series of flourishing clerical institutions throughout the Frankish dominions, which produced an able clergy and which lavished the utmost care upon the preservation of ancient literature. Foremost amongst these were Fulda, Reichenau and St. Gall.

It is an important fact that, from the ninth century onwards, medicine was included in the educational system of the Frankish monastic schools, adequate proofs of which are to hand. Reference need only be made to the favourite pupil of Alcuin, the "Primus Praeceptor Germaniae", Magnentius Rhabanus Maurus, who, in his standard work *De clericorum institutione* makes special mention of medical science amongst those subjects most desirable in the student's curriculum (*differentiam medicaminum contra varietatem aegritudinum*), and in his encyclopædia, modelled upon Isidorus, "Physica s. de universo", also gives a place to medicine. Medicine was taught as a part of "Physica".¹

For those pupils at least who intended later to officiate as clerics skilled in healing² instruction did not stop short at a few general theoretical facts, but proceeded to careful perusal of the medical authors, and—the most important matter—had to include practical training. The latter consisted in search for and collection of medicinal plants, in the preparation of medicaments, and most probably in rendering assistance at the bedside.

The medicinal herbs cultivated in the monastery gardens are described in the charming didactic poem "Hortulus" of the abbot of Reichenau, Walahfrid Strabo.

Walahfrid Strabo (Strabus) of Swabia, the most celebrated pupil of Rhabanus, one of the most learned and poetically gifted men of his age, abbot of the monastery of Reichenau (to which he owed his earliest education), died in 849 at the early age of 42. Of his writings the "Hortulus" has some medical importance; it is a spirited poem in 444 hexameters, and describes, with pronounced poetic talent, the herbs grown in the monastery garden with their medicinal virtues.

Opportunities for practical use of the knowledge thus acquired arose in the infirmaries and in the hospices belonging to monasteries or chapters; doubtless also the clerical physicians extended their aid to the necessitous outside the monastery walls.

¹ In the middle of the ninth century Bishop Ermenrich of Passau writes to the Abbot Grimaldus of St. Gall: "*Physica dicitur in arithmetica, astronomia, astrologia, mechanistia, medicina, geometria, musica, . . .*"

² In the records of the ancient monasteries certain monks were usually mentioned as having skill in healing, just as others were noted as poets, painters, art-workers, etc.

The rules of the Benedictines laid down that sick brothers should be given separate cells, and that a specially skilled and careful attendant should wait upon them. From this sick cell, with the enlargement of the monasteries, grew infirmaries, i.e. wards or entire establishments for the sick monks or nuns, to which also sick pupils and members of the monastic communities may have found admission. From these are to be distinguished hospices (hospitals), in which strangers were sheltered and where in addition the ailing were tended. The extent to which the care of the sick and the practice of healing received attention, at least in the greater monastic institutions, is proved by the still extant ground-plan of St. Gall, dating from the beginning of the ninth century. This includes a complete hospital establishment of several buildings, of which one contains rooms for severe cases, in close proximity to the dwellings of the chief physician and his subordinates; there are also various bath-rooms (for patients, monks, scholars), a venesection room, also used as a chamber for administration of remedies, a herb-room, in which doubtless not only were remedies stored but many medicines prepared; in the beds of the cloister-garden many medicinal herbs were cultivated (fœniculum, gladiolus, iris, mentha, piper, rosmarinus, ruta, salvia, etc.). The formularies of St. Gall and Reichenau appear to indicate that medicaments were supplied from the convent dispensary, not only to its members but also to outsiders, and that the cleric-physicians penetrated beyond the cloister-walls. The demand for foreign drugs could be supplied by merchants on their way home from Italy.

The remedies employed were largely vegetable; of the methods of administration the draught was the favourite, e.g. the *Potio Paulina* (elecampane wine). Prophylactic in addition to therapeutic ends were served by warm baths (in tubs), steam baths (by pouring water on heated stones), and venesection; hence in the design of monasteries bath-rooms and bleeding-rooms were arranged for. Early attention was paid by the monks to medicinal springs; not uncommonly a monastery was founded in proximity to one.

Many amongst the clerical physicians of the ninth and tenth centuries earned a high reputation for wide experience and skill, and abundant testimony to the enthusiasm for medical studies is borne by the manuscripts in monastic libraries, e.g. those of St. Gall, Reichenau and Chartres.

Although Germany under the Ottos had reached its highest pitch of culture (St. Gall, convent of Gandersheim, chapter-schools of Cologne, Magdeburg, Wurzburg, etc.), yet in the course of the tenth century the monastery and chapter-schools of France took the first place, and consequently the most prominent clerical teachers of medicine appear to have laboured there, as, for instance, in Chartres. Many famous physicians appear to have emanated from this school, and we read of Richerus that in 991 he personally undertook a difficult journey thither in order to benefit from the tuition of the learned Heribrand, who is said to have possessed great knowledge of pharmacy, botany and surgery. It was one of the characteristics of the growing desire for learning that gifted students travelled or were sent to such monastery or cathedral schools where individual branches of knowledge were particularly fostered. Richerus was one of the numerous pupils of the freest thinker of his age, the great polyhistor Gerbert (ca. 950–1003) who, with true humanistic zeal, added to the manuscript treasures of the libraries, reanimated philosophical speculation and inspired fresh spirit into the mathematico-astronomical studies of the West. From the

“Epistulae” of this gifted Frenchman we may gather that he possessed a literary knowledge of medicine far beyond the ordinary, but that he scorned the practical exercise of the art.

The ever-growing influence of the clerical schools of France made itself subsequently felt, not only in Germany but also in England, where, under the Norman dominion the national Anglo-Saxon literature, which had greatly developed after the end of the ninth century and medical treatises belonging to which are still extant, became extinct.

During the long period of adversity brought about by the Danish invasions, civilisation in England had declined, but in the last decades of the ninth century Alfred the Great succeeded in imparting a new impulse to it. Like Charlemagne, Alfred laboured to raise the level of education among the clergy, and he was even more successful than the former in awaking amongst the people some receptivity towards culture. In addition to the Latin, there was developed amongst the Anglo-Saxons a national literature—an unique phenomenon in the West—which included religious and scientific writings as well as poetry. The path for this was paved by Latin translations, the king himself leading the way with more or less free renderings into Anglo-Saxon of the historical works of Orosius and Bede, the book of Gregory upon the care of the soul, and the treatise of Boethius upon the consolations of philosophy. A share in the national prose literature was claimed by the Anglo-Saxon medical writings, fragments of which have survived. Dating from the time of Alfred the Great and shortly afterwards are the translations of Apuleius and of Sextus Placitus, and the Leech-Book, a *materia medica* in three books in the Anglo-Saxon tongue, compiled in the first half of the tenth century. The first book (a formulary with diseases arranged *a capite ad calcem*) and the second (more scientific, treating particularly of internal complaints) go together and constitute the Leech-Book of Bald, whereas the third is an independent, more concise, but similar work. The contents of the Leech-Book reveal a remarkable blend of antique book-lore with native empiricism. Therapeutics occupy the first place. Theory of disease, symptomatology and diagnosis, which only appear here and there (neither observation of the pulse nor uroscopy is mentioned), are based upon ancient tradition; in addition to scientific nomenclature Anglo-Saxon names are found. The *materia medica* contains partly rational and empirical means (in which the surprisingly large number of native vegetable drugs, the predominance of simples and the primitive methods of preparation are noteworthy), partly magical, for the most part Christianised, customs (invocation, charms, amulets, etc.). Surgery (treatment of wounds and fractures, scarification, cupping, cauterisation, blood-letting, amputation of gangrenous limbs) is relatively poorly treated. The descriptions of complicated operations (incision of hepatic abscess, harelip) leave it uncertain whether these were really performed or whether it is only a question of traditional book wisdom.

Whilst according due recognition to the literary enthusiasm for collation on the part of the monasteries, and in spite of the praise due to individual cleric-physicians, the medical conditions of this epoch must not be painted in over-bright colours. It was not alone that the garnered knowledge of ancient medicine was very incompletely known and not always worthily represented, that practice lacked independent observations, had but scanty and inefficient remedies at its command and laboured under the bondage of rigid rules, but also that medicine in the hands of many monks was no more than pious visitation of the sick, claiming only distant relationship with

profane learning, whilst the great majority held clerical miracles or Christianised popular remedies to be far more efficacious than any drugs.¹

How could it be otherwise at a time when religious thought, spurning temporal affairs, was in the ascendant, and when, despite the conservation of ancient practice, intellectual independence manifested itself at best in a symbolic, allegoric view of nature? ² The nature of the priestly art was well illustrated by the treatment meted out to sufferers from mental disorders, with exception of the weak-minded; they were considered as possessed, in accordance with which belief exorcism was held to be the sovereign remedy. In connection with this may here be mentioned the fact that quite early, in the public interest, justifiable measures were taken to isolate lepers in a lazaret-house under clerical supervision.³

In addition to clerical physicians there were also empirics, but no educated lay physicians, with exception of the Jewish healers, who occupied a place apart in the community and whose existence in the Frankish kingdom from a very early date is established.

According to a chronicle dating from the year 576 the blind Leonast of Bourges, through a miracle in St. Martin's church at Tours, regained his sight; he then returned home and, in order further to strengthen his vision, consulted a Jewish physician, who cupped him upon the shoulders, whereupon he became blind again—a tale, the trend of which is apparent. Under Charlemagne a Jewish physician accompanied the Frankish embassy to the Calif at Bagdad as interpreter. Louis the Pious and his son Charles the Bald had the Jew Zedekias as court physician. The favour that the latter enjoyed and his surpassing knowledge brought him under suspicion with the populace of being a sorcerer; after the death of Charles the Bald he was unjustly suspected of having poisoned his master—curiously enough no author makes mention of his punishment.

The only lay physician of this early age to bequeath us a small, if incomplete, medical work (in Hebrew) was an Italian Jew, Donnolo (tenth century), whose "Antidotarium" is throughout founded upon pure Graeco-Roman tradition.

Donnolo's career is included in the epoch, little illumined by the search-

¹ At least it was a widespread view that natural means only developed their efficacy in collaboration with theurgical, mystic procedures, and only drew their healing power from these.

² The endeavour to find in all natural phenomena secret relationships with and allegorical references to the supernatural is found particularly in the works of "Physiologos", who belonged to Christian circles in Alexandria, and who looked upon real or imaginary animals as symbolisations of certain virtues and vices. "Physiologos" found an almost unexampled popularity in the Middle Ages, being early more or less freely translated into the Oriental languages and Latin, later into Anglo-Saxon, Old High German, Early French, Provençal, Spanish, etc.

³ In order to prevent infection lepers were excluded from the community, declared civically dead—enactments upon this point were issued by Pepin and Charlemagne—as they had no personal means they looked to Christian charity for their maintenance; in districts where their numbers were large they seem early to have been assembled in common dwellings. In 736 St. Otmár collected the lepers of his diocese and placed them in a leprosarium in the neighbourhood of the monastery of St. Gall.

light of history, wherein the first indications of a striving towards advancement in medicine made themselves felt in Italy. Many clerics had indeed acquired eminence there during the eighth and tenth centuries as skilled in healing, whilst Monte Cassino, whose monks enjoyed fame in medical affairs, constituted itself a treasure-house of medical literature. The laity, however, never entirely relegated to obscurity by the clergy in the art of healing, was coming into its own.

The future of medicine depended upon organisation, upon the corporate and scholastic co-operation of such men as were able to devote themselves entirely to their profession, to make pure science their aim rather than theology and abstract morality. These conditions were first fulfilled in Salerno. There medicine, after a long minority, at last came into its heritage.

MEDICINE IN THE ELEVENTH AND TWELFTH CENTURIES

THE SCHOOL OF SALERNO IN ITS PRIME

THE history of the sciences is strongly reminiscent of the growth of organic structures. As in a homogeneous plasma individual nuclei make their appearance, grow, act as vital centres, and later blend to form more highly developed units, so in an historical retrospect of mediæval medicine in the West after 500 years' stagnation only isolated centres are recognisable—purely medical schools being few and far between—which from the eleventh century onwards are seen to arise apparently spontaneously out of a background of monotonous uniformity and for a long time to concentrate all scientific energy in themselves. With them medicine emerges from a state of suspended animation and awakes to a new and active life.

The rise of medicine once again coincides with a forward movement in general civilisation which made itself distinctly felt in the course of the eleventh and notably in the twelfth century, *e.g.* in the domain of theological dialectics (Anselm of Canterbury, Roscellinus, Abelard, Peter Lombard, John of Salisbury), of poetry, of music, not to mention the greater accessibility of ancient literature and the broadening of the ecclesiastical horizon as a result of closer relationship with the Eastern world, the deepening of religious feeling, the consolidation of political and social relationships (Imperial and Papal power, feudal system), the general advance of trade and commercial life—conditions which in part, either as cause or effect, were dependent upon the influence of the Crusades.

It is at first sight a striking fact that in this period of progress medicine in its rise took precedence of all other branches of learning, and, as early as the first half of the eleventh century, reached a pitch which implies a breach of the oft-repeated historical law which assigns to medicine a position of relative backwardness. Actually, however, things are quite otherwise. The rise of the healing art in the eleventh and twelfth centuries is not a general but only a local phenomenon, it is not a partial manifestation of the new spirit of the times then prevalent, it resembles rather the delayed germination of a plant, whose seed has long remained unfertilised, until the conditions necessary to its development were present. Thus it was that the scene of the first period of greatness of Occidental medicine was laid, not where the advance of civilisation was most clearly defined, but far afield, in remote Southern Italy, where foreign influences from the East made themselves strongly felt.

To the town of Salerno on the Tyrrhenian Sea, south of Naples, in one of the most beautiful and salubrious parts of Southern Italy, belongs the credit of having sheltered within its walls the earliest medical school of the Christian West. With the School of Salerno, which for centuries in the Middle Ages enjoyed a reputation comparable with that of Alexandria

in antiquity, there are indeed associated no epoch-making advances in theoretical knowledge and practical attainments, but it possesses nevertheless an immense importance as a connecting link between the medicine of antiquity and that of the West.

However unexpectedly the school of Salerno may have appeared upon the horizon of history in the eleventh century—with established organisation and advanced literary development—the *a priori* incomprehensible part of this phenomenon becomes less so in face of the fact that in Italy during early mediæval times there was no lack of diffusion of medical knowledge in non-clerical circles, of lay exponents of medical art, of salaried civic physicians and therewith of the requisite conditions for a teaching institution (cf. p. 9). Upon the soil of what was once Magna Græcia, where Byzantine influences were yet operative, and familiarity with the Greek tongue was not entirely a thing of the past,¹ and where scholarly rulers of Lombard extraction promoted the revival of culture upon the foundations of antiquity, were found conditions exceptionally favourable for knitting the ravelled threads of late-Roman tradition. It must have been under the influences of such circumstances that Salerno, famed even in antiquity for its healthy climate and frequently visited by invalids, developed into a *Civitas Hippocratica*, a rallying-point for physicians, who gradually united to work in accord—an analogy with or even a reproduction of a “*schola medicorum*” of the Romans. Certainly the physicians of Salerno, as early as the tenth century, enjoyed a fame which extended far beyond the precincts of the town. How and when a medical teaching institution was developed from the medical college, the *Collegium Hippocraticum*, whether quite independently or under external influences, cannot be ascertained with certainty from the available and partly legendary sources of information—one thing only is indubitable, that the school of Salerno was in no sense an ecclesiastical foundation and on account of its primarily lay character occupied a completely isolated position amongst ecclesiastical educational establishments and in clerical medicine.

Salerno, mentioned by a series of ancient authors, enjoyed a reputation as a health resort even in the Roman Imperial era. During the Middle Ages it played an important part in the political history of Lower Italy, and served as a residential capital for the dukes of Benevento and later for rulers of its own.

The origin of the school of Salerno is, in spite of the most careful research, still wrapped in obscurity. Of the conjectures that in the course of time have been made concerning it many are entirely devoid of any serious foundation, as, for instance, that Charlemagne, that Alexandrian refugees, or even the Arabs are to be considered the founders. There are not a few

¹ The Greek tongue survived for centuries as a living language in many districts of Lower Italy. As Adelard of Bath came, in the course of his travels (before 1116), to the neighbourhood of Salerno, he heard a Greek philosopher debating upon medicine and natural science.

arguments against the formerly widespread supposition that the foundation took place through the Benedictines from Monte Cassino—apart from the considerable distance between Salerno and the parent monastery of the Benedictines and the eloquent silence of the ecclesiastical chronicles upon any such foundation—notably the fact that in Salerno the heads of the school were married, and that women were even admitted as students, which would have been incompatible with the ecclesiastical character of the institution. The foundation of the school by the laity is not inconsistent with the fact that the clergy took part in the teaching, and no doubt the Benedictines were indirectly of great assistance in its first rise.¹

The information contained in the chronicles of Salerno to the effect that the school there was founded by four physicians of different nationalities, each of whom taught in his own tongue, is doubtless legendary, but it indicates as probable that, in addition to Graeco-Roman tradition, Jewish and Arabic influences, the latter doubtless from Sicily, made themselves felt, although the relative proportions of each can hardly be estimated.²

From the tenth century onwards temporal and spiritual magnates came, often from far afield, to seek aid from the *medici Salernitani*; thus, e.g., Adalberon, Bishop of Verdun, in the year 984; the Abbot of Monte Cassino; Desiderius (later Pope Victor III.) in 1050; Bohemund, son of Duke Guiscard; Robert son of William the Conqueror, the two last in order to be healed of wounds inflicted in war. During the Crusades wounded warriors returning home frequently sought refuge in favourably situated Salerno, whereby the physicians' experience received notable additions.

Medical education was in the hands of several teachers simultaneously (later 10); these were at first rewarded with the honoraria which were paid for instruction by the students; later they enjoyed, as did their pupils, exemption from taxation with, occasionally, the use of houses and land. To their demonstrations representatives of every nation and every creed had access. At the close of the eleventh century amongst the large number of students, often coming from afar, there were said to be included many Jews. When the town of Salerno, together with the whole of Southern Italy, came under the dominion of the Normans, and later was united with the kingdom of Naples and Sicily, the support of the school was not withdrawn from it, in fact its highest pinnacle of fame was attained under this rule. The flourishing condition of the school was maintained until the middle of the thirteenth century. Members of the best families of Salerno did not disdain to belong to the Collegium Hippocraticum.

The copious literature emanating from the Salernitans is mainly familiar through Henschel and Salvatore de Renzi. Henschel found, in 1837, a compendium, consisting of thirty-five writings, in the library of Breslau—"Compendium Salernitanum"—written in Italy towards the last third of the twelfth century, and containing for the most part only annotations of or extracts from original Salernitan writings.

Renzi made an exhaustive investigation of the manuscript treasures of Italy in search of Salernitan writings, and published the results of his meritorious labours—*Collectio Salernitana, ossia documenti inediti e trattati di medicina appartenenti alla scuola medica Salernitana*. Lately

¹ Salerno attracted invalids from afar, not only on account of its climate and adjacent mineral springs, but also as a place of pilgrimage (relics of St. Susannah, the Apostle Matthew, etc.). The Benedictines had a monastery there from the end of the seventh century onwards, with which was associated in 820 a hospital. Between theurgy and the worldly art of healing there were not yet such contrasts as in later times, we must rather presume the friendliest relations and accordance of views between the clergy and the Salernitan medical faculty; natural and supernatural healing agencies mutually reinforced one another.

² The earliest of these influences are doubtless to be sought in the materia medica, wherein commerce served as the connecting link with Sicily and the Levant. Possibly the Arabic schools in Sicily may have served as models. There is no proof of any participation of non-Christian elements in the schools, although it is historically established that Jews practised as physicians in Salerno. Probably, however, the practice of the Jews was usually confined to their co-religionists. The Jewish traveller Benjamin of Tudela, who visited Salerno shortly after 1160, makes the remarkable assertion—contradicted by other information—that amongst the 600 Jews there was no physician.

Piero Giacosa has considerably enriched our knowledge of the literature by the publication of many hitherto unknown Salernitan writings in the work, *Magistri Salernitani nondum editi, etc.*

The earliest literary monuments of the school of Salerno, written in barbarous Latin and intended to serve purely didactic purposes, date from the first half of the eleventh century and are based upon those traditions of pure Graeco-Roman origin which had survived into the unenlightened centuries of the early Middle Ages. These are for the most part compilations from the later Roman authors and from the scanty Latin translations by means of which an epitome was preserved of the remnants of Graeco-Byzantine literature.

The chief topic is therapeutics, which is not wholly devoid of traces of originality; the medical theory is a blend of humoral pathology and methodism. It is undoubtedly the medical fraternity as a whole more than any single author's individuality which finds expression in these first-fruits of Salernitan pens.

The principal representative of the early Salernitan period is Gariopontus (d. ca. 1050), of whose (putative) works the "Passionarius", a handbook of special pathology and therapeutics, enjoyed great popularity with contemporaries and later physicians as a model for medical studies. This is in no sense an original work, but only a clever, mosaic-like collocation of various literary fragments, derived in part from late Roman authors (particularly from Theodorus Priscianus), in part from old Latin translations or commentaries of ancient or Byzantine writers.¹

Gariopontus cannot herein lay claim to have produced anything original, unless possibly in the selection and arrangement of the excerpts; the work is indeed no more than a re-edition of an old publication. To the era of Gariopontus—possibly even to an earlier—is also to be ascribed the "Practica" of "Petroncellus", which begins with an historical introduction. Of the literary activity of several other contemporary authors, of Alphanus, the elder John Platearius and the elder Kopphon, we know nothing except through isolated fragments or references in later writings. Like the above-named, or even in a higher degree, the Salernitan woman physician, Trotula (ca. 1059), enjoyed a long-standing reputation as the authoress of writings upon pathology and therapeutics, particularly upon the diseases of women and their treatment. Doubtless much that has come down to us has no title

¹ The purpose which inspired the publication of the "Passionarius" was to provide an encyclopædic collection of the most essential medical (and particularly therapeutic) information for the use of practising physicians—a "Summa Medicinalis". The "Passionarius" of Gariopontus, however, had far earlier predecessors, and from the eighth century onwards the leaning towards similarly collected excerpts of theoretical and practical value can clearly be traced in the monastic codices, which contain the same material in a cruder form.

to her name, being of considerably more recent origin, or at least being much altered by interpolations.¹

GARIOPONTUS (also known as Guaripotus, Garimpotus, Garimpontus, Warmipotus, Warimbotus, Raimpotus, Warbodus, etc.) was probably a Lombard and practised in the first half of the eleventh century. The "Passionarius", which was ascribed to Gariopontus and was a compilation of Latin translations from Græco-Byzantine authors as well as from Caelius Aurelianus, Theodorus Priscianus, Aurelius and others, was not his own work but doubtless merely a fresh edition of a much older publication. The "Passionarius" was held in great esteem by contemporaries and later physicians, a fact which is evidenced in the title "Galenus Pergameni Passionarius"—due to an entirely false assumption. The five books of the "Passionarius" were probably originally one with the treatise *De febris*, which appears in many editions. The work is linguistically of interest (on account of many transition forms from Latin to Italian), and affords an excellent insight into the fundamental medical principles of the day. In the manuscripts the "Passionarius" is not always ascribed to Gariopontus.

PETRONCELLUS (Petrocellus, Petricellus, Petronsellus, Petronius). The fragments bearing these names are not the work of one and the same author. The first book of the "Practica" dates from the time of Gariopontus or earlier, and is etymologically characterised by a number of Latinised Greek words; the second and particularly the third books differ considerably from it. In the materia medica of Petroncellus isolated Arabic drugs, introduced through commerce, are mentioned. The fragmentary "Curæ" are probably of much later origin.

ALPHANUS (ca. middle of eleventh century), temporarily a monk in Monte Cassino, friend of Desiderius and later Archbishop of Salerno, is said to have been the author of the writings *De unione corporis et animæ*.

TROTULA, of the family of Ruggiero, presumably wife of John Platearius I., highly esteemed by her contemporaries for her learning, "sapiens matrona", and frequently quoted by later writers, is credited with the authorship of several works, mostly surviving only in manuscript form. That printed in her name, *De mulierum passionibus ante, in et post partum*, is proved to be a product of the thirteenth century, but probably represents an extract from a treatise of Trotula dealing with medicine in general. The work also touches upon many subjects hardly included under the title; e.g. physical education of children, dentition, cosmetics, etc. In the obstetric chapters, in addition to many superstitions, are found the warning, forgotten since the time of Soranus, against rupture of the perinæum, a description of perinaorrhaphy in complete laceration, and the recommendation, in order to assist expulsion of the dead foetus, to shake the patient.

To this epoch (ca. 1050) belongs also the "speculum hominis", a fragmentary didactic poem, probably written by an Italian about the middle of the eleventh century.

The literary firstlings of the school of Salerno are worthy examples of the fact that the strenuous spirit which animates the true physician is able to produce fruits of value in daily life from the most barren soil. Any rise above the comparatively low level of erstwhile attainment was hardly within the bounds of possibility, since the supply of raw material contained in the inadequate legacy from antiquity was bound to become exhausted through over-assiduous annotation and commentation. Hence Salernitan medicine

¹ The "mulieres Salernitanæ", frequently quoted by Salernitan authors on account of their wide knowledge, particularly in matters of gynæcology and cosmetics, were partly genuine women doctors, and it was no unusual thing for wives or daughters of the directors of the "Collegium" to become teachers or medical authoresses. Amongst these were mentioned in the course of centuries Abella (who wrote *De atra bile* and *De natura seminis* in verse), Mercuriade (who wrote *De crisis*, *De febre pestilentiali*, *De curatione vulnerum*), Rebecca Guarna (who wrote *De febris*, *De urinis*, *De embryone*), Constanza Calenda, and others.

at this epoch, whilst possessing the charm of fresh and unspoiled youth, appears, with its insecure theoretical foundations, with its crudely differentiated symptomatology, with its poverty-stricken therapeutical resources, meagre and unsophisticated when contrasted with the contemporary Byzantine or even Arabic art of healing.

It is not until the last decades of the eleventh century that development, in the sense of more rigid theorising upon broader lines, of a more subtly conceived symptomatology and amplified therapeutics, shows itself in the rapidly increasing literature. This change, which set in almost acutely, does not depend upon intrinsic conditions, but is to be traced back to the extraordinarily productive literary activity of a man whose connection with the school of Salerno is by no means clearly demonstrable, but whose powerful impulse left its mark upon the later achievements of the school, viz. Constantinus Africanus (d. 1087), who, by his Latin translations and compilations, supplied fresh matter for investigation to Occidental medicine, and at the same time (through the Arabs) cleared and made free the choked well-springs of antiquity.

Our information upon the life-history of Constantinus contains few certain data and belongs largely to the realm of myth. He is supposed to have been born in the first quarter of the eleventh century (ca. 1018) in Carthage, and to have acquired astounding and many-sided erudition, added to the most profound familiarity with Eastern languages, by means of travels lasting many years and extending into the far East. He then returned to his native country, but shortly had to flee, since, on account of his unusual knowledge, he fell under suspicion of witchcraft, and was thus exposed to persecution. Constantinus journeyed to Italy and lived some years in Salerno without our being able to say for certain whether he occupied the position of teacher at the school there. It is only established that he found a welcome in the monastic seclusion of Monte Cassino under the Abbot Desiderius, famous for his learning and for the library of his monastery, and that he here pursued an active literary career. He is said to have died about 1087 or later. The writings which bear his name are for the most part erroneously ascribed to him. On the one hand he is himself to blame for this, since he published translations or versions of others' writings as his own, whilst on the other hand the mistakes of later transcribers are in part at fault.

In addition to a not inconsiderable number of supposedly original works, of which the majority of those known to us have proved to be adaptations or renderings from the Arabic (Ali Abbas, Isaac Judaeus, Ibn al-Djezzar), Constantinus translated more or less freely into Latin (from Arabic versions) such works as the Hippocratic aphorisms, the *Ars Parva* (Microtechné) of Galen and the commentary of the latter author upon the Hippocratic writings, whereby the range of occidental medical knowledge was undeniably extended to a considerable degree, fresh life instilled into the study of ancient literature, and a model provided for posterity of scientific integration and expression.

The only actual pupils of Constantinus that have become known are the

monk Atto and Johannes Afflacijs, the latter of whom is supposed to have lived for a time in Salerno and, in his writings *De febris et urinjs* and *Curae* (Afflacijs), gives many proofs of good powers of observation.

The influence of the *magister orientis et occidentis* is nevertheless further reaching and makes itself distinctly felt in all subsequent Salernitans, many of whom quote him.

It was not that with Constantinus the system mania and the polypharmacy of the Arabs found an entry—the soil in the West was by no means prepared for this, and the Arabic authors whom the monk of Cassino made accessible were comparatively unsophisticated, like Isaac and Ali Abbas.

It was not that the Hippocratic tradition in Salerno had been stifled—in the Salernitan literature of the end of the eleventh and the first decades of the twelfth centuries keen observation, simple interpretation, unbiassed clear representation of morbid phenomena, inclination towards a dietetic therapy or towards one not overloaded with medicaments still held the field. After the appearance of Constantinus, however, the descriptive method, without degenerating into turgidity or becoming overburdened with quotation, became immeasurably more mature, and scientific foundations—thanks to an acquaintance with hitherto unfamiliar or imperfectly known writings of ancient origin—considerably broader; realisation of the importance of theory in medicine overcame the earlier empiricism, pathological conceptions showed greater sharpness and precision, Galenism began visibly to displace the last traces of methodism left as a legacy from Roman times, while symptomatology was simultaneously refined, although indeed for the most part along the lines of a subtle pulse-lore and neurology. These are the characteristics which distinguished the “*Practica*” of Bartolomaeus, the “*Ars Medendi*” of the younger Koppon, the “*Practica Brevis*” of the younger Johannes Platearius.

There is an extant work of Koppon’s which possesses a special interest because for the first time in Western mediæval literature it gives evidence of the practical study of anatomy—the so-called “*Anatomia porci*”. This little work, in conjunction with an anonymous treatise published shortly afterwards and usually designated “*Demonstratio anatomica*”, affords us a surprising insight into the anatomical knowledge and the conditions of anatomical instruction then obtaining among the Salernitans, which, although only obtained through zootomy, were certainly not of quite recent origin.

A counterpart to this of no less value—viz. in the picture it affords us of the behaviour of the Salernitan physician at the bedside—is found in the medical guide and clinical primer of Archimathæus entitled *De aventu medici ad aegrotum s. de instructione medici*. This contains maxims of medical

policy, directions as to methods of examination (particularly examination of the pulse and uroscopy), upon the conditions for venesection, upon invalid diet, upon the behaviour of a physician in the establishment of prognosis, and concludes with advice as to action in the matter of fees. Ripe experience speaks throughout from its pages, with a laudable trend towards an individualising, preferably dietetic mode of treatment. A "Practica" by the same author which is extant, unfortunately in incomplete form only, consists, as is stated in the introduction, of a collection of clinical expositions founded upon his own experience. It is evidence of the fresh and unspoiled power of observation native to the representatives of the school, of the method of instruction at the bedside, of the frequently purposeful therapy undertaken with simple means, mainly dietetic.

Bartolomeus published a clearly written text-book, the "Practica", with the sub-title *Introductiones et experimenta in practicam Hippocratis, Galieni, Constantini, graecorum medicorum*. Proofs of its lasting popularity are found in commentaries, early translations, extracts and adaptations in many languages.

Koplon the younger was the author of an anatomical treatise, "Anatomia porci", a guide to the practical study of the anatomy of the pig, following the example of the ancients, who applied the results of zootomy to human anatomy, upon the assumption that the internal organs of a pig most closely resembled those of man.

The "Ars medendi" (ca. 1090) deals with general therapeutics (dietetic prescriptions, instructions concerning purgation, cure of dyspepsia, etc.), and also contains one or two chapters upon the preparation of drugs. The "Practica", after an introduction upon pathology and therapeutics, deals first with fevers, then with other diseases, and finally with leprosy. The writing is distinguished above others by comparative purity of language as well as by its contents. Relying upon the Hippocratic aphorisms the author, in contrast with his contemporaries, strove after a simpler method of treatment, taking into account the course of the disease and making greater use of external than internal therapy.

"Demonstratio anatomica." This represents a demonstration relating to a dissection of a pig about to be undertaken and to one performed in the preceding year; the contents are essentially an elaboration upon a wider basis of the "Anatomia porci" of Koplon. The author vehemently apostrophises his pupils, indulges in a violent polemic against Koplon, and appeals to Hippocrates, Galen, and Isaac Judaeus. Regarding the preparations for the dissection it is recommended that the pig be killed by cutting the vessels in the neck, and that, suspended by the hind legs, it be allowed to bleed suitably. Killing by puncturing the heart is inadmissible, since by that means blood would penetrate into the "membra spiritualia", which would impede the demonstration of the latter; likewise dismemberment should be begun before the cadaver is cold, or else the "arteries, veins and nerves" will become shrunken and indistinct. The parts of the body are distinguished according to their function as *membra animata, spiritualia* and *naturalia*; the last are subdivided into *nutritiva* and *generativa*. In each of these groups there are again principal and subordinate organs with ancillary functions.

Johannes Platearius the Younger, so called in contradistinction from his father, was the author of a systematically arranged handbook of internal medicine, "Practica brevis", old Italian and French translations of which are still extant in manuscript form, also the "Regulae urinarum".

Archimatheus, possibly identical with Matthaëus de Archiepiscopo, is the reputed author of a "Practica" and a medical guide after an ancient model, *De adventu medici ad aegrotum* or *De instructione medici*. The work of Archimatheus, *De instructione medici*, is on the same lines as the anonymous *De adventu medici*, but the latter is less complete in details. The

deontological section—a mixture of piety, simplicity and shrewdness—gives an admirable picture of the strictly regulated behaviour of the mediæval physician at the bedside, of his method of examination, of his intercourse with the patient and his surroundings. The entire outward demeanour was in the Middle Ages subject to well-defined rules, which no one of breeding could transgress, so that men in general became somewhat stereotyped, vivid proof of which is given in the pictures adorning the manuscripts.

The best purview of the specialised pathology and therapeutics of Salerno during its prime is to be obtained from an anonymous work written in the twelfth century, *De ægritudinum curatione*, which treats in its first part of fevers, in its somewhat voluminous second part of local diseases *a capite ad calcem*. Whereas the doctrines concerning the fevers—notable for their simple classification—originate from one and the same author, the second portion, dealing with local affections, is a compilation of doctrines of seven of the most eminent masters of the school upon the same subjects, the “*Practica*” of Johannes Platearius (mentioned on p. 27) constituting the foundation (being absorbed in its entirety) and being followed in order by chapters from the work of Kophon, Petronius, Afflacijs, Bartolomæus, extracts from the writings of Ferrarius and Trotula being inserted here and there.

This patchwork compendium, which may be looked upon as the standard text-book upon internal medicine of the school of Salerno, is no doubt an accurate reflection of the scientific attainments of the first half of the twelfth century, and shows that the eminent masters had already succeeded in attaining to some degree of independence in their conception of disease and methods of treatment. Foretokens of the commencing but as yet insubstantial influence of Arabic medicine made themselves felt, but only as isolated instances—in references to Janus Damascenus and the “*Libri Saracenorum*”.

“*De ægritudinum curatione.*” Following the ancient teaching, the fevers (according to whether the seat of disease lies in the *pneuma*, the solid parts or the humors) are divided into one-day (*effimera*), hectic (*ethica*) and putrid fevers. Putrid fevers are again subdivided into intermittent and continuous. Treatment was preferably dietetic or refrigerant.

NERVOUS DISEASES AND PSYCHOSES.—Phrenitis was held to be an aposteme (abscess) of the anterior ventricles of the brain; lethargy, aposteme of the posterior. Similar attempts at localisation are to be found in the definitions of other diseases. Melancholia and mania are distinguished in that the former is an affection of the seat of reason, the latter of the imaginative power. Amongst causes are assigned mental affections, over-exertion, covetousness. The clinical picture varies according to the underlying humoral disorder; if the cause of the disease lie in the yellow bile the principal symptoms are those of exaltation; if in black bile, manifestations of depression and delusions of persecution. The therapeutics of the psychoses were constitutional (diet, purgation, blood-letting, internal and external measures) and psychic (“*verborum dulcedine et etiam artificio falsæ suspiciones removendæ sunt . . . adsint soni musicorum instrumentorum*”, etc.). In the treatment of epilepsy diet played an important part, in association with many extraordinary measures. Paralysis is defined as “*lesio partis cum privatione vel deminutione sensus vel motus vel utriusque*”; the accompanying tremor is

explained by the assumption of interrupted nerve-conduction. Convulsion arises "*ex inanitione et repletionē*"; plasters compounded of substances with sedative action are to be applied to neck and spine. A particularly complete section is that upon different forms of headache and their concomitant phenomena. In the treatment of hysteria "*suffocatio matricis*", pungent medicaments are employed for the most part (musk, ambergris), and, in addition, instructions are given relating to sexual life. Amongst affections of the respiratory tract a more or less detailed description is given of nasal diseases (epistaxis, *fœtor narium*, nasal polypi), ulceration of the trachea, cynanche, hoarseness, cough, asthma, pneumonia, pleuritis, empyema and phthisis. Pneumonia is defined as "*apostema circa pulmonem*", pleuritis as "*apostema in pleura*", the differential diagnosis resting largely upon the nature of the pain and of the urine. Therapy: chiefly dietetic measures, diaphoretics, venesection in robust patients (on the side opposite the lesion); on the critical day it was essayed to produce nose-bleeding by irritating the mucous membrane with hogs' bristles. Many of the prognostic dicta show good powers of individual observation: *e.g.* "*sputum sanguineum a principio, quod circa VII. et IX. diem in saniem convertitur et facile projicitur, bonum signum; sputum vero nigrum vel lividum vel viride perseverante dolore magnum; urina nigra et residens non malum, urina tenuis et alba sine aliqua detentione raptum materie significat et mortem*".

Amongst the causes of phthisis is given effusion of blood (from a ruptured vessel) and its subsequent conversion into pus: "*sanguis vertitur in saniem, et sanies inficit et ulcerat pulmonem*". In incipient consumption the greatest importance is attached to ample nourishment. The occurrence of hectic fever is explained upon an entirely mechanical basis, viz. that the lung, on account of the ulceration present, is restricted in its movements, absorbs less air, and thus the heart is insufficiently cooled. Two varieties of consumption are distinguished, one with, the other without ulceration of the lungs. Particular weight is attached in diagnosis to fetid odour of the breath; constant fever, attaining no high degree, emaciation, curved nails, nature of sputum, loss of hair, and diarrhœa herald a fatal termination. Syncope is in several places referred, partly to the stomach, partly to weakness of the heart; ætiological factors are psychic influences, inanition, plethora, etc.; sudden death is, when other causes cannot be proved, attributable to syncope, caused by obstruction of the vena cava.

AFFECTIONS OF THE INTESTINAL TRACT.—Detailed descriptions are given of pain in the stomach, nausea, dyspepsia, anorexia, bulimia, eructation, hiccough, diarrhœa, meteorism, etc., a causal therapy being mostly aimed at. Amongst vermifuges are included: aloes, succus absinthii, persicaria, pulvis centonica = santonin. In dysentery astringents are administered following upon the exhibition of purgatives. The differential diagnosis between ascites and tympanites rests amongst other things upon the results of percussion; in the former the belly gives a sound as of a half-filled skin, in the latter that of a drum.

URINARY AND SEXUAL DISORDERS.—The chapters upon hæmaturia, stone in the kidney, dysuria, strangury, paralysis of the bladder are distinguished by many excellent observations, and the endeavour to apply topical treatment is noticeable. Considerable space is assigned to the chapters upon the affections of the genital tract, particularly the sections wherein aphrodisiacs, abortifacients, and methods of promoting or preventing conception are treated of.

As far as surgery is concerned, the writing "*de ægritudinum curatione*" contains mostly directions concerning salves, decoctions, poultices, etc.

In obstetrics we find little beyond prescriptions and superstitious measures.

Otological diseases mentioned are: pain with or without ensuing suppuration, ulceration, worms, foreign bodies, deafness, tinnitus. In therapeutics harmless (partly popular) remedies were employed. An important piece of advice given is that local inspection of the ear should precede any treatment.

Although many of the Salernitan writings so far discussed possessed a significance extending beyond their age and place of origin, yet none of these contributed even approximately as much to the lasting fame of the school as that peculiar literary product, probably dating from the twelfth century,

known under the name of "Regimen sanitatis Salernitanum", a medical didactic poem, written in Leonine verse.¹ This in its original, and comparatively restricted, shape was a collection of dietetic and prophylactic rules, intended more for the laity than for scientific study, but which in subsequent centuries by means of additions of the most varied kinds grew more and more into a metric encyclopædia of medicine. It owed its almost unrivalled popularity less to its contents than to the easily remembered form; the aphorismic significance and popular, ingenuous mode of expression of its maxims, which for centuries were verbally transmitted in the medical world, were a standing temptation leading to the production of imitations and amplifications, and even to-day survive in the proverbial speech of most nations.

The world-renowned didactic poem of the school of Salerno probably originated at the end of the eleventh or beginning of the twelfth century, and may be described as the collective effort of the medical rhapsodists. The oldest version, doubtless most closely in accordance with the original, is contained in the works of Arnaldus of Villanova. The poem here takes the form of 362 Leonine verses, so popular in Norman times, and the contents, dealing mostly with dietetic and prophylactic measures, bear the impress of the first Salernitan period. In the course of centuries, however, this ground-work received so many additions and insertions that the "Regimen sanitatis Salernitanum", originally intended more for the laity, became actually converted into a versified handbook of the whole range of medicine, in which the different epochs of the Middle Ages have left their traces. The number of verses grew until ten times the original total. Probably everything not concerned with diet is of later origin. The insertions by a variety of authors explain the fact that there are in matters of detail many contradictions. In keeping with the incomparable and not yet outlived popularity and wide distribution is the enormous number of editions and translations of this didactic poem (into German, French, English, Italian, Dutch, Czech, Polish, Hungarian, Provençal, Irish, Hebrew, Persian, etc.), no less than 240 editions being enumerated up to 1857.

The commencement of the Regimen Salernitanum runs in the majority of manuscripts, "Anglorum regi scripsit Schola tota Salerni". This dedication was considered to refer to Robert, son of William the Conqueror, who spent some time at Salerno in order to obtain treatment for a wound of the arm received in the East, and who, after the death of his brother, William II., was pretender to the throne. As, however, the inscription is entirely lacking in many manuscripts, or since "Francorum" often takes the place of "Anglorum", this is probably only a later addition.

The high value of the "Regimen sanitatis Salernitanum" and of the scientifically more important work "de acgritudinum curatione" lies in the fact that they offer a true picture of the appreciation of hygiene and dietetics typical of the old school and of the leaning towards a really simple therapeutic method free from all polypragmatical excess. Unfortunately this state of things did not last, and as early as the first half of the twelfth century, partly through the influence of the writings of Constantinus (particularly "de gradibus medicinarum"), there were increasing signs of an

¹ Pentameter and hexameter, in which middle and termination rhyme, e.g. "Post coenam stabis seu mille passus meabis"; "Contra vim mortis nulla est herba in hortis".

imminent development in an opposite direction, in that of the subsequently dominant therapy by drugs and formulæ (on the pseudo-scientific basis of the doctrine of quantities). Nicolaus Praepositus, in the first decades of the twelfth century, led the way as the author of a formulary published, as he himself says, at the desire of his colleagues, founded upon ancient models and upon Arabic patterns. This formulary, which contains for the most part very complex medicinal formulæ with instructions as to effects and mode of employment, played a most important part, not only in Salernitan practice, but also in that of the whole Middle Ages, and was the basis of all future pharmacopœias. It called forth an entire literature of commentaries, the earliest of which appear to be writings of the younger Matthaeus Platearius, little less famous than the original work itself, viz. his "Glossae" and his highly meritorious pharmacologico-botanical *materia medica* "*Simplici medicina*" (named also "*Circa instans*," from the introductory words). The strong predilection obtaining for a largely medicinal therapy on the Arabic pattern is notably instanced in the "*Compendium*" and "*Tabulae*" of Mag. Salernus. Happily there was not entirely wanting a counter-current which showed itself at least in endeavours towards the simplification of the *materia medica*, an excellent example of which is seen in the exhaustive commentary of Bernardus Provincialis upon the above-mentioned "*Tabulae*" of Mag. Salernus. A really refreshing impression is produced amidst this therapeutic wilderness by the admirable work of Musandinus upon invalid diet, "*De cibus et potibus febricitantium*", an imitation of the Hippocratic "*Diaeta in acutis*".

Apart from the predominance of drugs in treatment, the undeniably encroaching Arabic influence is betrayed by another symptom in the literature. This is the growing number of writings upon uroscopy, amongst which the "*Regulae urinarum*" of Maurus and the treatise of Urso, both largely inspired by Isaac Judaeus, attained no little reputation.

Of the remaining Salernitan authors of the end of the twelfth century, Ricardus Salernitanus (on account of his anatomy), Ferrarius, Romualdus and his pupil Johannes Castallius deserve mention.

Nicolaus Praepositus (*i.e.* head of the school) flourished at the commencement of the twelfth century. His *Antidotarium* contains in alphabetical order 139 medicinal formulæ, for the most part very complicated (electuaries, syrups, potions, "*metradata*" antidotes, pills, etc.), named after the discoverers,² the contents or the disease in the treatment of which the medicament is to be employed, with direction upon the mode of action, employment, and preparation.

A striking note is that upon anæsthetic inhalations in surgical operations by means of the "*spongia soporifica*".

The *Antidotarium* acquired a lasting authority as a text-book for apothecaries and called

¹ The prophet Ezra figures amongst the putative medicinal discoverers.

for a whole literature, in the shape of translations into Italian, French, Spanish, Hebrew and Arabic commentaries and elaborations. It formed the ground-work for later pharmacopœias. To the same author is probably also to be ascribed the "*Tractatus quid pro quo*", which is included in many editions of the above.

Matthæus Platearius (junior), son of Johannes Platearius II., about the middle of the twelfth century, wrote a commentary to the *Antidotarium* of Nicolaus Praepositus, "*Glossae vel Expositio(nes) in Antidotarium*". This deals in alphabetical order with 273 simple medicaments, the origin of which is given, together with the signs of their genuineness and distinction between different varieties.

Petrus Musandinus—ca. middle of twelfth century. Of his works there is in existence a "*Summula de praeparatione ciborum et potuum infirmorum*", to which no doubt the short pamphlet "*De cibis et potibus febricantium*" also belongs; the model for these writings was no doubt the Hippocratic "*Diaeta in acutis*". Amongst other things is recommended a species of meat extract, prepared from fowls. This work shows at any rate that invalid cooking received considerable attention; a notable direction is that meat and drink should be served in attractive vessels, and that some attention be paid to patients' appetites.

Magister Salernus (ca. 1130-1160). His "*Compendium*" treats of the definition of medicine, the origin, the external and internal signs of functional disturbances, general ætiology, followed by the action and preparation of the various digestives, expulsives, emetics, purgatives, hydragogues, laxatives, constringents, styptics, diuretics, etc.; a large place is occupied by the preparation and employment of syrups. A noteworthy point is the emphasis laid upon the Hippocratic axiom, so far as possible to assist the healing powers of nature.

Bernardus Provincialis (ca. 1150-1160) was the author of most exhaustive and interesting commentaries upon the *Practica* of Bartholomæus and the *Tabulae* of Mag. Salernus, in the latter of which the endeavour to simplify the *materia medica* and the predilection for homely remedies stand out.

Maurus (ca. 1160) wrote, in addition to a commentary upon the Hippocratic aphorisms, the widely read "*Regulae urinarum*", a uroscopy based upon Theophilus and Isaac Judæus. Maurus paid attention to the colour, consistency, amount and contents. He distinguished nineteen colours of the urine, the origin of which was dependent upon the modification of the elementary qualities. As in the human body, so in the urine, four regions are distinguished; the position in the urine-glass in which alteration in colour, cloudiness, etc. was observed, was of special significance.

Urso: "*Compendium de urinis*".

Richardus (Salernitanus), ca. 1130-1180. The "*Anatomica*" of this author is probably part of his "*Practica*", which survives in MS., being in form and contents reminiscent of the *Demonstratio Anatomica* (cf. p. 28). Like the latter it is a theoretical introduction to an autopsy to be undertaken on a pig.

Romualdus Guarna (Archbishop of Salerno) wrote, amongst other things, "*De pulsibus*".

Johannes de Sancto Paolo, pupil of Romualdus, cardinal (ca. 1215). In many MSS. the book "*De virtutibus simplicium medicinarum*", printed amongst the works of Constantinus, is ascribed to him.

Before the close of the twelfth century the Salernitan school added to its many laurels with a new title to fame by re-establishing, after a long interval, upon a scientific foundation, the art of surgery which, during early mediæval times, had sunk to so low a level. In the Christian West surgery had so far been entirely lacking in any such foundation, because the cleric-physicians—from causes connected with their priestly office—held as a rule aloof from operative manipulations and were obliged to relinquish these to uneducated empirics: *Ecclesia abhorret a sanguine*.

Doubtless among the physicians of Salerno surgical traditions, in conjunction with medical, had been handed down from ancient times. Nevertheless, so far as the works of Gariopontus, Petroncellus, Trotula, or even the treatise "*De aegritudinum curatione*" afford any information on the subject—no corresponding practical application seems to have been made of them for a long time. Even the authoritative works of Constantinus, which made the surgical achievements of the past more readily accessible, brought about little change. The considerable increase, however, which during the Crusades made itself felt in the demand for surgical treatment, and the widened opportunities for obtaining experience, made it impossible that the school of Salerno, situated on the lines of inter-communication and representing the Western art of healing, should stand aside from the forward movement. The greater zeal lavished upon surgery at the end of this period and the higher position conceded to it finds literary expression in a work published about 1180 by Roger (Ruggiero, sometimes called filius Frugardi) and several other contributors, and which thenceforward served as a text-book for the surgical demonstrations at Salerno as well as the ground-work for a series of commentaries. This, the oldest surgical book known in the mediæval literature of the Christian West, is the "*Practica chirurgiae*" of Rogerius, known also from its introductory words as "*Post mundi fabricam*". It is distinguished by brevity and lucidity of exposition, and is based, not on a far-reaching tradition, but upon the independent experience of the author, his teachers and colleagues. Constantinus seems, nevertheless, to have been made great use of as a source of inspiration. Roger has for the most part strictly practical ends in view, and therefore, with the exception of a few paragraphs, deals almost exclusively with therapeutics, chiefly non-operative. Healing of wounds is sought by means of substances causing suppuration; in case of hæmorrhage suture and ligature were made use of in addition to styptics. Skin diseases, which were long the domain of the surgeon, occupy considerable space; it is an interesting fact that mercurial ointments were much employed in chronic skin affections and parasitic diseases. Considering the period it is hardly a matter for surprise that Roger did not hesitate frequently to recommend superstitious measures.

There is much in common between the above-mentioned work of Roger and the "*Chirurgia*" (Jamati) of Jamerius, which, in spite of its shortness, is divided into nine books, the resemblance extending to style and method as well as contents.

The doctrines and practice of the Salernitan masters did not remain confined to the schools, but were spread far and wide by zealous pupils. One of these may be looked upon as the herald of the fame of the school on the far

side of the Alps, viz. the poet-physician, Gilles de Corbeil (Petrus Aegidius Corboliensis), who transplanted Salernitan medicine to Paris and gave expression to its most important achievements in attractive form. His long-famed and widely circulated medical didactic poems "De urinis, de pulsibus, de virtutibus et laudibus compositorum medicaminum, de signis et symptomatibus aegritudinum" constitute a paraphrase, from many points of view interesting even to-day, of the above-mentioned Salernitan writings, and in particular arrest attention on account of the light they shed upon contemporary manners and customs.

Pierre Gilles de Corbeil (a small town near Paris) was educated at Salerno, and lived later as Canonius and body-physician to King Philip Augustus (1180-1223), probably also as teacher of medicine in Paris up to the beginning of the thirteenth century.

The "Liber de urinis", an early writing of the author's which, according to his own statement, was published untimely against his will, constitutes a compendium of uroscopy (in 352 hexameters), mainly following the lines of the "Regulae urinarum" of Maurus. The "Liber de urinis" remained till the sixteenth century the authoritative text-book of uroscopy, and was the subject of repeated commentaries. It contains a description of the points to which attention has to be paid in inspection of urine, viz. quality (colour), consistence, contents (opacities, deposits), quantity, position in the urine-glass occupied by opacity, etc., time of voidance, age, temperament, sex, age, mode of life, and psychic condition of the patient.

"De pulsibus" is a didactic poem in 380 hexameters preceded by a fairly long Prooemium in prose, wherein the prevailing physiological theory is examined.

Aegidius takes his stand in examination of the pulse upon Galen, Constantinus and Philaretus, who have written upon this subject, but in his subsequent metric dissertation claims to have avoided the errors of his predecessors. His work is divided into three sections, the first of which deals generally with the ten main forms of pulse, the second and third with the method of examination, the different varieties, and their pathological significance. "Libri de laudibus et virtutibus compositorum medicaminum" is a didactic poem in 4663 hexameters divided into four books, with a short introduction in prose. This less successful work consists mainly of a versified paraphrase of the "Antidotarium" of Nicolaus Praepositus and the "Glossae" of Matthaeus Platearius. Eighty medicaments are described. The greatest interest of the poem, however, is from the point of view of the history of civilisation, the author throwing many sidelights upon medical professional conditions.

The conclusion we arrive at is that it was due to the school of Salerno that the healing art of the Christian West once more awoke from its five centuries of lethargy to a vigorous life, and through the influence of that school attained a height which made competition with the Byzantines and Arabs a possibility.

In the midst of barbaric disruption, surrounded by degraded superstition and crude empiricism, the Salernitans preserved the scanty remnant accruing to them from the legacy of antiquity as a palladium for better times, and as these dawned, they exerted themselves to the utmost in order to add to their inheritance, to unite the isolated fragments into an harmonious whole with the cement of original achievement and independent observation and experience. If from amongst them there arose

no Hippocrates, yet the footsteps of the incomparable master of antiquity showed them the way and saved them from straying afield as did so many who followed in much later times.

The Salernitan masters were the first in the Christian West to establish an independent nursery of medicine, serving the interests of science only, where all branches alike found recognition; they strove by practical instruction and didactic literature to make their knowledge and capacity common property; they ennobled the healer's art and established precedents which bound to unalterable standards all who wished honourably to bear the title of physician.

Analysis of Salernitan medicine leads us to the following chief conclusions. Anatomy was studied practically, but was confined to zootomy, in particular to inspection of the viscera of swine. It is worthy of recognition that the necessity of anatomical studies in medical education was expressly emphasised, and that here and there the attempt was made to apply anatomical discoveries to the explanation of pathological changes. Physiology was dominated by Galenism and to a less extent shows the effects of Arabic influence (through the medium of Constantinus). The basis upon which it was founded was that of teleology, and the doctrine of organic forces. The "*virtus motiva et sensibilis*" is enthroned in the brain, the "*virtus vitalis et vegetativa*" in the heart, the "*virtus nutritiva et augmentativa*" in the liver, the "*virtus propagativa et generativa*" in the generative organs. In accordance with these, four sorts of organs, "*membra animata*" (brain, nerves, etc.), "*m. spiritualia*" (heart, lungs, etc.), "*m. nutritiva*" (liver, etc.), "*m. generativa*" (testicles, etc.), are distinguished, and four regions of the body. The "*virtus nutritiva*" is the most important for the maintenance of life, its chief organ, the liver ("*prima radix corporis*"), is therefore the first to be formed in the development of the individual. The "*virtus vegetativa*" (*vitalis*) comes next to "*virtus nutritiva*," its chief organ, the heart, is therefore developed next in order to the liver. The "*virtus motiva et sensibilis*" is more exalted, but its function sets in later, on which account its central organ, the brain, is only developed after the liver and heart. The "*virtus generativa*" has comparatively subordinate, less essential significance. Each organ has subsidiary and protective organs (*e.g.* the brain has nerves, dura, etc.). General pathology is mainly founded upon the doctrine of the four cardinal humours, but in many details traces of methodism may be discerned. Diagnosis rests upon observation of disturbances of function, the most important sources of information being examination of the pulse and uroscopy—the latter in particular as a direct consequence of prevailing physiological views. The

pulse affords the criterion upon which the condition of the heart (vital warmth, vital forces) and respiratory passages may be judged ; it should be examined with observation of certain precautions, mostly in the left hand (on account of the proximity of the heart) and for at least 100 beats. Ten main forms and numerous varieties of pulse were distinguished. A yet more important part was played by uroscopy, as is shown by the not inconsiderable number of special works.

The uroscopy of the Salernitans was founded upon the writings of Theophilus, and especially of Isaac Judæus. The theory rests upon the assumption that urine is a colature derived from the blood (formed in the liver) and the other cardinal humours. In accordance with this view conclusions were drawn from the urine, not only as to the state of the urinary apparatus and tract, but also as to the state of coction in the liver, the state of the blood and other humours, and the constitutional condition. The domain of uroscopy embraced all diseases based upon humoral anomalies, or at least having some connection with these. Whilst the pulse afforded chiefly prognostic information—its quality is determined by the heart, the seat of the “*spiritus vitales*”—the urine was considered to make special diagnosis possible. Both methods, pulse examination and uroscopy, complemented one another. In uroscopy, apart from individual circumstances, colour, consistence, quantity and deposit were considered.

The special pathology is distinguished by plain, life-like descriptions of disease and is not deficient in independent observations ; descriptions worthy of mention are those of alternating fever, mental disturbances (following the methodists), inflammation of the lungs and phthisis, as well as of many skin and venereal diseases (leprosy, morphea, impetigo, scabies, tinea, “*malum mortuum qui lupus vocatur*,” etc., ulcers of the genitals).

Beneventus Graphæus, the most celebrated mediæval ophthalmic surgeon, is only quite distantly connected with the school of Salerno. He was a native of Jerusalem, made himself familiar with Arabic medicine, and studied in Salerno under Nicolaus Praepositus. In his wanderings through Italy and southern France (as a peripatetic cataract extractor) he was used to teach and gave everywhere, in Salerno as in Montpellier, the same clinical lectures (doubtless for a large fee). From these grew his “*Practica oculorum*,” a work which, disseminated in numerous manuscript versions, was early translated, and for centuries was held in great esteem.

In therapeutics the fundamental principle—regulation of the mode of life and nourishment of the patient—was never entirely lost sight of, but the effect of external influences was to enlarge the method of treatment, which was initially hygienic and dietetic, coupled at most with “*digestiva*,” mild aperients and venesection, into a well-provided medicinal therapy ; whilst constant evidence is found of a praiseworthy endeavour to provide, by means of homely substitutes, for less well-endowed patients.

There were many indications in favour of venesection, but careful consideration was paid to age, strength, seat and stage of disease, time of year, etc., while definite rules guided the choice of veins, and amongst the older authors in particular, the preference prevailed for *venesectio e contrario*. Small blood-lettings served prophylactic purposes.

Through the pharmacopœia the demands of habitual and wealthy patients were pandered to. The most marked example of a costly medicament was furnished by the “*Diamargariton*,”

a drug (for hysteria) specially prepared from pearls. As early, however, as in Kophon's "*Ars medendi*", simple measures, in contrast with the costly exotic drugs, were provided in the interest of the *medicina pauperum*.

The school of Salerno removed the paralysing consciousness of intellectual inferiority that for centuries had oppressed the succeeding generations, awakened hopes of a future of scientific activity, the psychological effect of its achievements showing itself in nothing so much as in the fact that, under this influence, the far-seeing Norman princes finally put a drag upon the liberty of action of medical charlatans. In 1140 Roger, King of Sicily, published an edict to the effect that no one, under penalty of severe punishment, should undertake practice who had not through proven capacity obtained the necessary permission from the State authorities.

Salerno so dominates this era with its brilliance that it is easy to overlook the newly awakened medical life which elsewhere began to stir, as well as the commencements of what were to be the important medical schools of the future. Thus there began to arise, if only in dim outline, a medical institute in Bologna, whilst medicine was probably taught openly in Paris from 1180 onwards,¹ but there are more complete proofs of the existence of a school in Montpellier.

Like the *Collegium Hippocraticum* in Salerno, the school of Montpellier constitutes the full fruit of a process of development reaching far into the past, historical knowledge of the early stages of which is wanting. Tradition and considerable circumstantial evidence speak in favour of Arabic and Jewish influences playing an important part in its origin. It may be mentioned, in particular, that Montpellier stood in much closer cultural and political relationship with Aragon than with northern France, and that the population contained a considerable leavening of Spanish Arabs and Jews. Under such circumstances medical practice probably lay largely in the hands of these, and many of them may have become teachers.

The flourishing medical schools of the Spanish Arabs doubtless served as models, although it remains an open question whether the Jewish educational institutions, in which medicine was also taught, exercised any influence.

The earliest information dates from the year 1137, and refers to (the later bishop) Adalbert of Mayence, who, as his biographer Anselmus relates in verse, came in his student travels to Montpellier, and received instruction from the teachers of medicine upon the causes of natural phenomena and disease. Further, we learn from a letter of St. Bernard in the year 1153 that the Archbishop of Lyons journeyed to Montpellier to obtain treatment at the hands of the local physicians, and upon this occasion had need of more money than he had brought with him. That Montpellier, towards the end of the twelfth century, was already a rival on equal terms with Salerno, may be gathered from the words of John of Salisbury, of Alexander Neckam, and from paragraphs in Gilles de Corbeil, the last of whom is an enthusiastic partisan of Salerno. Moreover, certain Salernitans appear temporarily to have taught in Montpellier.

¹ Hugo, called *Physicus* (d. 1138), and Obizo (d. 1199), court physician to Louis the Fat and Abbot of St. Victoire, are said to have taught medicine publicly. The real founder of medical instruction, however, was Gilles de Corbeil in the time of Philip Augustus; at any rate it was he who secured a recognised place for medical science in Paris on the same footing with theology and arts.

The famous monk Caesarius of Heisterbach calls Montpellier "the source of medical wisdom", but remarks regretfully that the physicians there decline to believe in miraculous cures, and express themselves ironically upon the subject.

Being only in the early stages of their development, these schools contributed little to the literature, and what literary output this epoch can show belongs to the early mediæval products of the monastic intellect. Amongst these are the didactic poem "Macer" or "Macer floridus, de viribus herbarum", which was highly esteemed as late as the sixteenth century; the metric work upon precious stones, "Lapidarius" ("De lapidibus pretiosis") of Bishop Marbod; and the treatises, interesting from many points of view, of St. Hildegard, "Physica" and "Causae et curae".

"Macer Floridus, de viribus herbarum", the celebrated didactic poem, consisting of 2269 hexameters in barbarous Latin, treating in 77 chapters of 77 plants, beginning with artemisia, was probably published in France. The author is usually held to have been Odo of Meudon, from Meune sur Loire, or the Cistercian Odo of Morimunt in Burgundy; its date the last quarter of the eleventh century. The title "Macer Floridus" was meant to be reminiscent of the Roman poet Aemilius Macer, in order to ensure ready recognition for the work—with what result is proved by its wide circulation and high repute, lasting into the sixteenth century. The sources from which the "Macer Floridus" derived its inspiration were Pliny, Latin versions of Dioscorides and Oreibasius, Galenus ad Paternianum, Gargilius Martialis, Pseudo-Apuleius, Palladius, Constantinus Africanus, etc.

Marbod, Bishop of Rennes in Brittany (d. 1123), is the supposed author of a didactic poem of 743 bad hexameters dealing with the healing and miraculous powers of 60 precious minerals. This contains mainly fables found already in Pliny and elsewhere, but its great popularity amongst contemporaries and in the following centuries is proved by the early translations and frequent reprints.

St. Hildegard (1099–1179). The works upon natural science and medicine passing under her name, the "Physica" and the "Causae et curae", both of which are derived from the traditions of the Benedictines as well as from popular customs, afford a good insight into German natural philosophy and monastic medicine in the twelfth century—even though much of their contents may have been added at a later date. St. Hildegard received a conventual education from her eighth year onward; she founded a convent on the Rupertsberg near Bingen, of which she was a most admirable abbess. Said to have been without any higher education up to her forty-third year, this gifted woman filled the gaps in her knowledge to such purpose that she was enabled to appear as the authoress of numerous, mostly theological and mystical writings, and to acquire a reputation for profound learning; in spite of bodily ill-health she was a considerable traveller, whilst she maintained correspondence with many eminent men and had the reputation of a seeress.

Such independent literary productions were unimportant when contrasted with the strenuous activity in copying which constantly enriched the libraries of monasteries and institutions.

Two manuscripts may here be mentioned as examples of monastic industry which, on account of their supplementary illustrations, are most remarkable: the Copenhagen Moschion MS. of the twelfth century with its fifteen coloured pen-and-ink sketches of fetal positions, and an anatomical pamphlet of the year 1154 with five drawings of the course of the arteries and veins, structure of bones, muscular and nervous systems.

In practice, however, ecclesiastical medicine had already passed its

apogee, although the clerical physician does not for a long time disappear from Western civilisation. The change was brought about, not only by the rise of the laity, but also by the oft-repeated prohibition of the Church—although at first devoid of decisive result—forbidding professional practice of medicine to the regular clergy and monks for obvious reasons, and even attempting to limit the study of the same.

Notably under Pope Innocent II. edicts were given forth (Council of Clermont 1130, of Rheims 1131, Lateran Council 1139) against medical practice by ecclesiastics. These interdicts on the part of the Church were directed in particular against the evil which had gradually crept in of priests and monks at times neglecting their proper duties in favour of a lucrative practice and jeopardising the dignity of their office by affording a foundation for scandal. They were directed also against the abuse whereby many only sought clerical privileges in order to be able to pursue a secular occupation under favourable conditions. The interdicts were further directed, however, against medical study itself and medical instruction on the part of the priests, the more rigid asceticism practised in the twelfth century by the Cistercians¹ and Cluniacensians making its influence felt in this connection.

Nevertheless, the interest in medicine and the confidence which the people traditionally reposed in the clergy in medical matters were too powerful to be rapidly overcome merely by the edict of a council—particularly in those countries where facilities were wanting for the education of lay practitioners. The repetition of the clerical edicts and their resuscitation in much later times go to prove that they bore but little fruit. Throughout the twelfth century there continue to be found, in no small numbers, eminent representatives of the medical art amongst the Benedictines and many high dignitaries of the Church famous for their medical attainments.

The medical profession was for the most part recruited from the better elements, so far at least as the influence of the celebrated schools of Salerno and Montpellier extended. Only too soon, however, did charlatans learn to utilise for their deceitful purposes the authority associated with the names of these institutions, by claiming to have acquired their knowledge at them. Amongst a minority of educated physicians, crude empirics, male and female quacks held their own, and amongst the population a belief in medical miracles took firm root.

Extracts from Gilles de Corbeil go to prove that, towards the end of this epoch, a certain responsibility began to show itself in the school of Salerno, to its detriment, "green, beardless, boys" being dignified with the title of physician and even assuming the position of teachers.

Satirical attacks upon the medical profession are to be found in many writers of the twelfth century, particularly John of Salisbury (1120-1182), whose statements, taken *cum grano salis*, shed light upon contemporary conditions (the learned disputes, empty verbiage and greed of the physicians).²

¹ St. Bernard of Clairvaux, who himself performed many miraculous cures, forbade his monks the use of drugs or recourse to medical aid. St. Bernard also relates in one of his letters that a monk had sought asylum with him, stating that he was compelled by his Abbot to extend medical aid to tyrants, robbers and the excommunicated.

² John of Salisbury alludes to the advice concerning demands for fees which recurred not infrequently in Salernitan writings; in face of the doubtless not rare niggardliness of wealthy patients there was some excuse for making favourable use of the opportunities that presented themselves. We also learn much from him concerning the appearance, luxury in clothes and outward display of the medical celebrities of the twelfth century.

There is but scanty information concerning the physicians of Germany at this period; the scientifically educated belonged doubtless chiefly to the clergy. Surgery, in particular, was very backward, being left in the hands of ignorant empirics.¹ The Jewish physicians enjoyed no little reputation, particularly in the higher social circles, and in spite of the endeavour of the Church to limit their practice amongst Christians. It is interesting, for instance, to note that Archbishop Bruno of Treves had a learned Jew, Joshua by name, as physician. In Prague during the twelfth century almost the entire medical practice was in the hands of Jews.

It is a noteworthy phenomenon that in this era the tendency had already manifested itself amongst the laity to make philanthropic care of the sick their concern. If not at first explicit, their endeavour found expression in the foundation of brotherhoods for the care of the sick—even though the guardianship of the Church and the monastic form of the pious lay associations may have more or less obscured the underlying nature of the historical process. The most important of these Hospitallers were the Knights of St. John, the Teutonic Knights, the Lazarists, but in particular the order of the Holy Ghost, founded at the end of the twelfth century.

The three first-named knightly orders of Hospitallers (not according to their origin, but to their later development) were a fruit of the Crusades and the Holy Land; apart from the care of the sick and poor in hospitals—which at first formed the exclusive purpose of the brotherhoods—they made war against unbelievers their task. We know most concerning the philanthropic practice of the Knights of St. John. In the statutes laid down in 1135 by Raymond de Puy occurs the regulation that in the hospital at Jerusalem there should be five physicians and three surgeons. In the statutes of 1181 (Roger de Moulin) it is expected of the salaried physicians that they be adept in uroscopy and in the preparation of syrups. Care of the sick fell mostly to the lot of the servitors, brothers who were united in a league with the knights and ecclesiastical orders. The Lazarists devoted themselves to the care of lepers; as late as the year 1253 the Grand Master had to be chosen from amongst the leprous knights belonging to the order.

The order of the Holy Ghost, which had its origin in a Hospital founded by Guy of Montpellier in his native town, consisted originally of a lay brotherhood which very soon increased its numbers. The order attained its chief importance in the commencement of the thirteenth century, when Pope Innocent III. entrusted it with the management of the Hospital of San Spirito in Rome, which in the development of the hospital system stood as a pattern to all countries. In the twelfth century there were also founded the Hospitaller orders of St. Protais and St. Gervais, the order of the union of Hospitallers of St. Katherine, the Filles et Dames Hospitalières, etc.

The Hospitaller orders were, however, always founded on a religious

¹ Duke Leopold v. of Austria fell on Christmas day of the year 1194 from his horse and sustained a compound fracture of the leg. The surgeon called in treated him with plasters and drugs till mortification set in. They lacked courage to perform amputation, although the patient himself desired the operation. Thereupon the duke bravely seized a battle-axe, placed it upon the leg and commanded his attendant to strike it with a hammer. At the third blow the limb was severed. Then only did the surgeons return to their work, but death ensued the next morning.

The Margrave Dedo von Rochlitz und Grotz was to have accompanied the Emperor Henry vi. to Apulia in 1190, but, on account of his obesity, feared the heat of the climate and the fatigue of the journey. A physician, whom he consulted on this account, simply cut into his belly in order to remove the fat—an operation from the results of which the Margrave rapidly succumbed.

basis, and the Church invariably succeeded sooner or later in regaining control over these or in suppressing any leanings towards emancipation.

The superintendence of xenodochia, hospitals and leper-houses, remained for the meanwhile in ecclesiastical hands, and their number was largely added to in the times of the Crusades.

The first attempts at an institution of a secular care of sick and poor, which were inspired by Charlemagne (by the establishment of royal hospitals under the superintendence of special officials), were nipped in the bud, and after the middle of the ninth century every variety of philanthropic institution, even if founded by laymen, was subject to clerical control.

Apart from the lazarettos, there hardly existed in the West before the thirteenth century, real hospitals in our sense of the word ; the " Hospitals " evolved from the xenodochia served not only for the reception of sick and criminals, but also for the reception of poor travellers, hospitality, care of the sick and relief of poverty being still inextricably intermingled.

Such charitable institutions were early found in Italy, France and Spain, later in England and Germany.

As leprosy increased enormously in Europe during the eleventh century, leper-houses had to be greatly multiplied. In Italy and France there also existed separate establishments for those unfortunates who were attacked by the prevalent epidemic of ergotism (*ignis sacer*), under the superintendence of the brotherhood of St. Anthony.

The increase of and improvement in institutions for the relief of the sick, as well as additions to the means of healing, may be traced back to the augmented intercourse with the Eastern world brought about by the Crusades ; an indirect influence upon medicine is possibly also ascribable to the rich domestic and social aftermath of the Crusades—the real contact with the science of the East, so important in its influence upon medicine, was, however, taking place simultaneously, far removed from war and rumours of war, by other means in Spain and Southern Italy, in the form of a greatly developed activity in translation. Hereby the twelfth century laid the foundation of the scientific edifice of the later Middle Ages.

ARABIC INFLUENCE UPON WESTERN MEDICINE

THE life-work of Constantinus Africanus was apparently merged in its entirety in Salernitan medicine without producing any noticeable alterations in the traditions of that school, which had been handed down from late Roman times. Actually, however, this by no means exhausts the historical rôle which the monk of Monte Cassino was destined to play. That which was begun by Constantinus under a cloak of pseudo-originality—the Latinisation of Arabian and Græco-Arabian medicine—called for continuation and became an important prelude to that powerful intellectual movement which set in strongly with the twelfth century, and brought Islamic and Occidental civilisation into close touch with one another, supplying new and strange impulses, richly energising, to Western science, which had hitherto drawn its inspiration mainly from Roman-Christian tradition.

Just as the Moslems were once, by way of Egypt, Persia and Syria, the recipients of Greek knowledge clothed in the language of the Koran, so now the tide of culture, stamped with an individuality of its own and with by no means unimportant additions, set backwards towards the West—in the shape of Latin translations from the Arabic. It constitutes one of the most peculiar phenomena in the history of civilisation, and the most striking proof of the power of the thirst for knowledge to overcome all obstacles in the shape of racial and religious incompatibilities, that the West should have displayed the most ardent desire for the “*Doctrina Arabum*” in this epoch, when Christendom and Islam stood, along the whole littoral of the Mediterranean, face to face in almost constant feud.

The Crusades notably broadened the mental horizon, kindled the desire to assimilate the achievements of the Saracens, and led to the acquisition of a store of the material products of civilisation from the East; but the triumphal procession of science was not eastwards, but principally towards that land where for centuries Christians and Moslems had stood shoulder to shoulder, in daily intercourse, whether as friends or foes—towards Spain, where the richest harvest of Arabic civilisation had ripened.

The marvellous culture of Moorish Spain early awakened in Christian Europe astonishment and admiration; thus, *e.g.*, the magnificence at the court of Abdarrahan is painted in lively

colours by Johannes von Gorz, who went as ambassador from Otto I. to Cordova, and the poetic abbeß Hroswitha lauded Cordova in a poem as "bright ornament of the world, shining in full possession of all things".

In the Christian kingdoms of Spain, in addition to the Cluniacensians and Cistercians coming from France, the chief agents of civilisation were the Mozarabes and Jews. The fanaticism of the Almorawides and Almohades caused the flight of many Jews into the neighbouring Christian states of Spain, and even further afield into Southern Italy, Sicily and the south of France. It may be mentioned that the earliest medical work written in the Castilian language and dealing with fevers is the work of a Jewish physician of the eleventh century.

It is only rarely that we find Latin translators of Arabic works in the East—as far as scientific medicine is concerned we have only to consider Stephanus of Antioch, who in 1127 made a most inadequate translation of the "*Liber Regalis*" (*regalis dispositio* or *al miliki*) of Ali Abbas—but, on the other hand, Toledo in particular, which had fallen into the hands of the Christians, became, with its rich manuscript treasures, the Mecca of scholars thirsting after Oriental wisdom.

Certainly during the period extending from the middle of the twelfth to the middle of the thirteenth century it was this town, the great repository of Arabic literature, in which the interchange of Arabic and Latin books and learning took place, in which native scholars worked side by side with Italians, Germans and English, at the great work of interpretation, and in which the greatest number of translations were undertaken. From Toledo the West received not only masterpieces of Arabic philosophy, mathematics and astronomy, but in addition to Arabic commentaries, also long-withheld legacies from antiquity, the most important of which were the hitherto unknown writings of Aristotle (upon natural philosophy, psychology and ethics) and the *Almagest* of Ptolemy.

Toledo, which, shortly before the conquest, was one of the chief seats of Arabic learning, particularly of studies in mathematics and astronomy, whose schools and well-stocked libraries had attained far-reaching fame in the West, was, if not the only, at least the most important site for the communication of Oriental learning to the West. There was here a store of valuable manuscripts, which attracted from all quarters foreigners eager for knowledge; here lived many polyglots, who facilitated study of Arabic literature on the part of strangers; here princes and clerics, far removed from the book-burning vandalism of later days, not only tolerated continuation of study on the part of Arabs, Mozarabes and Jews, but also translation of Arabic masterpieces into the learned tongues of Western Europe. In order to provide a firm foundation for these endeavours Archbishop Raymund (d. 1150) went so far as to institute a special school of translation in Toledo, under the superintendence of the Archdeacon Domenico Gundisalvi, which displayed great activity up to the middle of the thirteenth century and exerted considerable influence upon Occidental learning.¹

¹ The school of Toledo was not alone the source of a stream of Latin translations, but fostered independently philosophical, mathematical, astronomico-astrological and scientific studies upon Arabic lines, which even eclipsed its original more restricted purpose. These brought it a great reputation, but also, later, the unenviable notoriety of being the seat of magical arts. From every country scholars found their way to Toledo in order to study the secret arts of astrology and magic, held to be inseparable from the wisdom of the Arabs.

The energy of the translators expended itself first upon the mathematico-astronomical writings of the Arabs or upon the Arabic renderings of Greek authors ; soon, however, works upon medicine and natural science were included.

The technique of translation was most faulty, since this was effected, exclusively at first, and later by no means seldom, by way of Castilian in this manner, that the " translator ", having little or no familiarity with Arabic, caused the text to be read to him in the Spanish vernacular by some one well acquainted with the language, and wrote it down at once in Latin from this dictation.

The most fertile translator of the Toledo group, the actual " Father of translators ", was the Lombard, Gerhard (Gherardo) of Cremona (1114-1187), who, under the protection of the Emperor Frederick I. (Barbarossa), originally travelled to Spain with the sole purpose of bringing the works of Ptolemy home again, but then, as if rooted to the spot, spent the greater part of his life in the capital of Castile, filled with inextinguishable zeal for the treasures of Arabic literature—learning and teaching, reading and translating. His translations, exceeding seventy in number, laid every branch of knowledge, particularly mathematics and astronomy, philosophy and medicine, under obligation to him for a rich addition drawn from Arabic and Arabic renderings of Greek literature, an immense new material for further exposition and commentary. A mere enumeration suffices to afford some estimate of the gain which accrued to Western medicine through the unexampled industry in translation of this one man. He rendered into Latin writings of Hippocrates and Galen, of Serapion, Rhazes and Isaac Judaeus, the Surgery of Alkmaion, the Canon of Avicenna, the *Materia Medica* of Abenguefit and others, an addition to the literature the importance of which for these times cannot be belittled, even if the general quality of these translations is admittedly not very high.

Much time had to elapse before the astonishingly prolific output of the Lombard could be incorporated into Occidental medicine, but the fame of Gerardus as a discoverer incited others to work and gave them an impulse along the same path. Through the busy industry of translators, knowledge of the medical masterpieces of Arabic literature increased greatly during the thirteenth century—Averroes and Avenzoar need only be mentioned—and in addition many more of the writings of antiquity (particularly Galenic) were made familiar.

Borne upon the tide of an intellectual movement which swept over the whole of Western Europe, a striking proof, both in form and matter, of the advance of science, Arabic medicine, passing from Northern Spain to Languedoc and Italy, obtained entry to the medical schools, Salerno, the *Civitas Hippocratica*, wedded to ancient tradition, alone offering resistance for a time. This, however, was in its turn broken down as a result of the general civilising influences which, under powerful patronage, had long and

continuously made themselves felt in Southern Italy, particularly those emanating from Sicily. On this beautiful island, where three civilisations—Western, Byzantine and Saracenic—elbowed each other, blending wonderfully under the beneficent rule of Norman and Hohenstaufen princes, Arabic culture met neither opposition nor admiration coupled with suspicion and aloofness, but rather warm interest and glad receptivity. Evidence of this assimilative tendency, finding clear expression in form of government, administration and social usages, in art and science, was seen in the considerable translated literature which began at the time of the first rulers of the house of Hauteville, but which attained its highest development and universal importance under the two Hohenstaufens, Frederick II. and Manfred.

The Norman rule in Sicily stands out, from the wise toleration shown towards the religion and customs of the subject Moslem population, as a bright spot in mediæval history. Even if this tolerance was part of the wise policy of the numerically small dominant race, yet it speaks for the rare sympathy with culture of the princes of the house of Hauteville that they should have admitted their indebtedness to foreign civilisations and should have afforded whole-hearted support to Arabic poetry, architecture and science (particularly geography and astronomy). At the court of Palermo Arab scholars found the friendliest reception and the most generous support, as is shown by the relations between the celebrated geographer Edrisi and King Roger II. Frederick II., the whole of whose early education was upon Arabic lines, perpetuated the traditions of the Norman princes and surrounded himself with a complete staff of Arabic physicians, philosophers, astrologers and poets, and commissioned learned Christians and Jews to translate into Latin Arabic works, especially upon philosophy and astrology. The most noted of these was Michael Scotus, who, notably by his versions of Aristotelian writings upon natural science and psychology, with the commentaries upon them by Averroes, of the zoology of Aristotle and the compendium based upon it of Avicenna, exercised a considerable influence upon the intellectual history of the Middle Ages. Frederick II. himself gave a great impulse to the dissemination of the Arabic version of Aristotle by sending the translation to several of the universities of the West. Frederick's son and successor, Manfred, followed closely in his father's footsteps; he dispatched the collected Aristotelian writings to the University of Paris and caused further translations into Latin to be made.

The stimulus which Frederick II. and his son Manfred had imparted to translation by no means died away when Charles I. of Anjou made himself master of Naples and Sicily. As in many matters the conqueror of the Hohenstaufen dynasty trod in the footsteps of his predecessors, so did he prove himself, although with less enthusiasm, a patron of the civilising work of translation, his attention being primarily turned to the literature of medicine. The foremost of the translators in his service was the Jewish physician, educated in Salerno, Faradj ben Salem (also known as Mag. Farachi, Faragut, Farasius, Ferrarius, Franchinus) of Girgenti, who rendered into Latin the monumental work of Rhazes, the "*Continens*", and thereby introduced to the medical world of the West the third great Perso-Arabian. Faradj, moreover, translated the tabular work of Ibn Jezlar, *Takwin*, the

surgery of Pseudo-Messua and the pseudo-Galenic work "*De medicinis expertis*".

In order to procure a good copy of the famous "*Continens*", Charles I. had gone so far as to send a special embassy to the ruler of Tunis. Faradj ended his translation on February 13, 1279, and further enriched it with a glossary, "*tabula de nominibus arabicis*". The king caused the work to be revised by a medical commission and to be reproduced in 1282 in a magnificent manuscript, now in the national library in Paris.

The translations of Faradj contain many errors in names, but are on the whole more correct than those left behind by Gerhard of Cremona.

As has already been indicated, the natural intermediaries between East and West—the Jews—rendered great service to translated medical literature as well as to the spread of Arabic culture generally, partly by interpreting the Arabic text verbally or providing a rough draft to be turned into Latin, partly by themselves undertaking the rôle of Latin translators. Hebrew renderings of medical writings not infrequently also served, especially later, as foundations for Latin versions.

Although the choice of translated works was often determined by chance, whereby many admirable literary productions were eclipsed by others less worthy, nevertheless the majority of contemporary Latin versions from the Arabic failed to reach even the least exacting standard, taking age and conditions into consideration. Quite apart from the fact that any textual criticism was entirely wanting, the technique of translation in the majority of cases is upon the lowest level. From the language in which the translations are couched, the authors have been rightly termed "*Barbaro-latini*", since they were superior to all rules of grammar. Names are everywhere mutilated, the technical terminations are frequently—as a result of "*inopia latinitatis*"—simply transcribed (or corrupted) so that the meaning is to-day only made out with difficulty. The slavish method of translation (word for word) by those who at times had insufficient technical or even linguistic knowledge at their disposal, makes it comprehensible that grotesque perversions of meaning should not be uncommon; frequently it appears as though the reader were left by the unintelligent translator to read his own meaning into the confused text. Gross textual blunders could hardly fail to be present in cases where the original Greek writings had reached their Latin form only through the medium of several tongues.

Nevertheless the influence which the Latin versions of Arabic writings exercised upon Western medicine was a most important one through the rich accretion of salient matters of fact, of new and methodically arranged food for thought. Their most notable achievement, however, consisted in the fact that they brought to light, more distinctly and in great numbers, traces of the Greek masters; that the legacy from antiquity, if often

garbled and defaced, received notable additions; that the desire was early kindled for an acquaintance with the sources of Arabic scholastic lore—the original Greek texts—and the very inadequacy of the translations may have increased this desire. Arabic authors in their Latin garb led into the outer precincts—to find a way thence into the innermost sanctuary, this was the future task of Western physicians.

MEDICINE IN THE THIRTEENTH CENTURY

ARABISM AND SCHOLASTICISM

WITH the thirteenth century medicine, in common with other branches of Western culture, passed into a new phase, sharply differentiated from the preceding phases of development, which owes its characteristic features to the reception, dissemination and independent elaboration of Arabic literature.

But this epoch also bears witness to the historical law that new intellectual movements attain full expression later in medicine than in other branches of civilised life, for the healing art did not become thoroughly impregnated with Arabism in theory and method until the second half of the century, *i.e.* only after it had been long outstripped in the race by philosophic speculation and research in other subjects.

Thus, whereas the auspicious beginnings that young twelfth-century humanism and dialectics had evolved from such scanty sources were all too quickly blighted by Arab peripateticism, adolescent Western medical tradition offered a stout if temporary resistance to the inevitable victory of Arabism.

This opposition was not everywhere of the same strength and obstinacy ; it was naturally most powerful and lasting in Salerno itself, the fame of which depended indeed upon the maintenance of ancient tradition and was therefore now threatened. But even in Salerno, where, since the time of Constantinus, Arabic influences had made themselves felt, in many branches at least of medical science (particularly *materia medica*, anatomy and surgery), the hindrance was not to new observations and fresh experience, not even to therapeutic exaggeration, but was directed against that theoretic subtlety and hyper-rationalistic systematisation which found their fullest expression in Avicenna's Canon, so contrary to the homely Salernitan way of thinking.

The main point around which the conflict centred was that of scientific method, and a little reflection shows that the standpoint of aloofness taken up by the *Civitas Hippocratica* was not simply the expression of an unintelligible rivalry or of a hide-bound conservatism, but sprang rather

as an inevitable consequence from Salernitan culture as a whole. Although sober practitioners, not "sicklied o'er with the pale cast" of abstract thought, heralds of a rational empiricism, were those who had made the school great, yet it was the method of instruction and investigation, imbued with the true spirit of medicine, which caused the name of Salerno to shine like a beacon-light from afar. The Salernitan medical intellect could by making concessions come to terms with the lesser authors introduced by Constantinus, also with Ali Abbas and the clinician Rhazes: submission to the dictation of Avicenna, however, the highest representative of medical Arabism, demanded an actual repudiation of the principles so high-enthroned, so loyally upheld. Moreover, to appreciate the refinement of this master of syllogism, to penetrate the subtleties of his closely-woven doctrine, to add scope to his thought, called for a preliminary education in sophistical dialectics and their application to medical problems which, if one may judge from the writings of Salerno's prime, was as yet wanting in its educational system, as well as in its scientific practice.

The obstacles which Galenism in its Arabic garb encountered—most of all in the centre of Salernitan medicine, less by comparison in the school of Montpellier, which was better prepared through historical circumstances—were not opposed to the far more rapid invasion of Arabised versions of Aristotle and his commentators; the paths for these had long been paved through severe mental discipline by scholasticism, which made its first appearance in the ninth century and had already attained to great heights in the eleventh and twelfth centuries. The significant conjunction of Western Christian with Arabic philosophy could take place the more easily in that they had a common method, and the difference between them to be reconciled was only due to the breadth of the ancient foundations, to the inexhaustibility of the underlying problems.

Similarly, if any coalition were to ensue between Western medicine and Arabic, which in its highest development was permeated through and through with the Aristotelian spirit, it was an essential condition that medical investigators should adopt the method upon the effectual use of which the whole greatness of the foreign masters rested, *i.e.* should devote themselves wholly to the world of ideas of the Stagirite, familiarise themselves thoroughly with the philosophic technique, acquire the dialectical skill necessary for the platform. In other words, Arabic influence forced Western medicine to renounce its sequestered existence of centuries in medical schools, to forsake its isolation and to seek to join forces with philosophy. This conjunction, which in antiquity was manifested rather in the form of a union of personalities and which from now on became a lasting union of

subjects, came to pass in this epoch through the momentous alliance with scholasticism.

The transformation occurring in the pursuit of scientific medicine naturally afforded opportunity for other educational centres in addition to those under discussion to arise or to assume importance. The new requirements were met by such of the new schools as had, in keeping with their development and organisation, long brought medicine into touch with other branches of knowledge, more efficiently than this had been done by decadent Salerno, although it was only very gradually that the outer form of the institutions was followed by an inner, organic unity. These were to be found amongst the universities, the highest seats of scholastic learning, which had taken well-defined form from the beginning of the thirteenth century onwards. There, where the fruitful spirit of co-operation celebrated its victories on the field of intellectual endeavour, later mediæval medicine was born from the union of Arabism with the scholastic method, there medicine once more became an important link in the chain of general scientific evolution.

No exact date can be fixed for the origin of the oldest universities, since they arose by degrees out of the growing intellectual life of the twelfth century and in response to the demands of the scholastic world for organisation and protection of its rights. They were developed from private schools (*e.g.* Bologna from a school of law), or in association with the older ecclesiastical foundations (Paris, Oxford)—not, however, directly from these as was formerly thought—and they gradually established their footing on a co-operative basis by submission of their affairs to the ecclesiastical and state authorities; they hardly attained to any more secure organisation before the early part of the thirteenth century. In the course of the thirteenth century not a few seats of learning sprang into being as offshoots of the oldest universities or modelled upon their pattern, particularly in the Italian towns with their mutual rivalries, whilst the Emperor Frederick II. (as King of Naples and Sicily) and Pope Gregory IX. founded technical schools as early as the first decades of this century (Naples and Toulouse respectively). The theory that papal or imperial sanction was necessary as a preliminary to the founding of a Studium Generale arose by degrees in the second half of the thirteenth century, but obtained complete acceptance only later.

In early mediæval times medicine as a science had won for itself a modest position amongst the liberal arts—but only as an appendage to clerical education; in Salerno it attained to independence—but divorced from the pursuit of science in general; in the early days of the universities it once more took its place amongst the sciences, for the first time with full equality of rights and standing, a position which shortly found expression in the regulation of professional and educational conditions. In this period those conditions were for the first time completely fulfilled which made it possible to set up some definite standard for medical studies and for an examination system and, under the influence of ecclesiastical or temporal power, to establish upon a legal basis the necessity for proof of capacity as a requisite for medical teaching or practice.

In Montpellier the transition from untrammelled freedom in study and instruction to legal regulation was effected by the statutes which gave the first strict regulation to the local "*Universitas medicorum tam doctorum quam discipulorum*" and placed the school under the supervision of a chancellor. According to these statutes, promulgated in 1220 by the Papal Legate, Cardinal Conrad, only those were permitted to assume the position of teachers of medicine who had been examined in the subject and received a licence from the bishop under supervision of and examination by his teachers. In the year 1230 it was enacted that no one should undertake medical practice without having first undergone interrogation before two masters of the healing art with successful results; the punishment for breach of this law was excommunication. That these laws against charlatanry were of little avail was proved by their frequent re-enactment.

The ordinances of the Hohenstaufen Frederick II., as ruler of the two Sicilies, were of the greatest importance—with reference to the school of Salerno, which had been transformed into a State institution, they represent the earliest attempt at a State organisation of the medical teaching and examination systems. Permission to practise medicine after preliminary examination was made dependent upon the State; breach of this rule incurred severe punishment. The period of study extended, according to the medical constitution of 1240, over a period of five years, in preparation for which a three years' course of logic had to be undergone. The foundation of instruction rested upon the interpretation of Hippocratic and Galenic writings of theoretical and practical content, surgery being included in the plan of study. In order to attain the necessary practical confidence, the young physician, after undergoing his tests, had to spend another year under the guidance of a more experienced, older colleague. Surgeons had to adduce proof of at least one year's study, and particularly of diligent attendance upon demonstrations on human anatomy, prior to being admitted to examination before the medical college. A diploma was issued with the licence granted by the State officials; by the oath which the young physician had to take, he bound himself to give his advice free to the poor and to report to the authorities any druggist who should fail to prepare medicaments according to the prescription. The maximum fee for a visit by day within the boundaries of the city was laid down as a half gold tarrenus (ca. one shilling); visits further afield were at a correspondingly higher rate. Physicians were strictly forbidden to enter into any commercial relations with apothecaries or to be the owners of an apothecary's shop.

The regulations laid down by Frederick II. with special reference to Salerno served on the whole as models for the medical course of study in other technical schools, a several years' course in arts being in particular universally enforced. In Paris the student of medicine had, according to the earliest statutes (of the years 1270–1274), to give evidence of a period of five and a half years' study, provided that he had already graduated in arts; the same held true for Montpellier. Gradually it became customary—following the school of law of Bologna—to introduce an intermediate examination two to three years after the beginning of medical study, in order to furnish information upon the degree of general theoretical knowledge in the individual branches of medicine.

In Salerno the introduction of the baccalaureate took place at the latest in 1280, following a decree of Charles I.; the baccalaureate and the licentiate (at the end of the period of study) were preliminary steps towards the Magisterium, or later for the degree of Doctor,¹ which carried with it reception into the medical corporation (faculty) and permission to teach. In the first instance it was only the schools of law which granted the Doctor's degree, but as early as the thirteenth century the custom spread to the other faculties, with the exception of that of arts, in which the title of Magister was preserved.

¹ Scientifically trained physicians originally bore the title Magister. In the course of the thirteenth century, however, following the example of Bologna, the title of Doctor gained entry into the medical schools, but was at first applied in the original sense of the word, only to those who pursued the avocation of teachers of medicine. It became by degrees the custom to give the title of Doctor to all physicians legally entitled to practise the art, since all had the potential right to teach.

The licence was in most of the schools conferred by the chancellor, *i.e.* by a dignitary of the Church, in the name of the Pope, whereby the ceremony took on a religious character. Only in exceptional circumstances, where a Jew was concerned, was the conferring left to the faculty itself.

Affiliation with the universities undoubtedly raised the scientific standing of the healing art, ensured the continuity of its teaching, regulated its legitimate practice; undoubtedly also, through scholarship derived from Arabic sources, through dialectics borrowed from scholasticism, medicine acquired the impress of scientific attainment. The result, however, of the rigid mediæval corporate spirit, bound up in outward observances, of the over-rich tradition, foreign in origin, of the method borrowed from the faculty of arts and founded upon abstract reasoning, was to smother investigation which, if so far jejune, was nevertheless not entirely lacking in unbiassed observation and free criticism, and to set in its place belief in authority and rigid dogmatism. Under the ban of these two reactionary powers medicine became in form at least and without obvious incompatibility an integral part of Western Christian civilisation, then at its zenith, teachers and scholars alike belonging (if no more than nominally) to the ecclesiastical order—although medicine in its aims remained something intrinsically alien from the dominating ascetic, hierarchical spirit of the times, from the prevailing and exclusively transcendental cosmic view.

The spirit of the age which, abjuring the world, esteemed all temporal affairs only from the point of view of the hereafter, and the mediæval theory of life, at its height in the thirteenth century, which considered the sensible only as the symbolic expression of the transcendental, supplied no intellectual stimulus to the science of healing, which made bodily well-being its aim and with which, therefore, these were in direct antagonism. Medicine could only outwardly, only formally be forced into line with the phenomena of civilisation as a whole, by burdening it with the yoke of a method originally designed to serve the purposes of speculative theology, but which, overstepping its limits, finally bound all intellectual life in syllogistic fetters, hampered it with logical controversy. This method encouraged submission to recognised authority and to doctrines labelled as dogmas, and in over-estimation of one-sided intellectualism did not take sensible experience as its starting-point, but rather sought *a priori* to explain individual phenomena from axiomatically assumed premises, and thought it possible to establish the inter-relationship of things in fact through the association of ideas in logic. This method was thus better fitted for any other branch of knowledge than medicine, wherein observation is imperatively demanded. It is thus explicable that the eleventh century, which in many other domains of Western civilisation undeniably shows clear manifestations of the spirit of

the age and creditable achievements of sagacity or creative power, and which even brought forth evidence of technical progress (compass, gun-powder, spectacles), represents for medicine an epoch of stagnation which, by an imposing expenditure of erudition and subtle ingenuity, merely simulated progress.

The thirteenth century—especially the first half of it—represents the classical era of mediæval culture, in so much as its motive power, the ecclesiastical idea, was, in all branches of knowledge, now at its zenith. Advancing from gloomy catacombs to gorgeous basilicas and lofty domes, guided by wise popes, supported by the new hosts of mendicant friars, the Church, triumphant over all opposition (Waldenses, Albigenses, Hohenstaufens), laid claim to temporal and educational as well as spiritual control, and dominated with its far-reaching and never-failing influence every relation of daily life. Widely if not universally accepted as an accomplished fact, this system of ascetic hierarchy sought to realise the unworldly ideal of Christianity by the establishment of an ecclesiastical theocracy or its equivalent through transference of all secular authority to the Church. No attempt can here be made to enter into details of political and social conditions, all that can be done is to give a general survey of the character of the intellectual life of the period. The fact must especially be emphasised that, within certain limits, a scientific and artistic activity was developed reminiscent of the most brilliant epochs of the past, which on the one hand was centred in the universities and on the other found its loftiest expression in the most splendid architectural monuments, in magnificent cathedrals. Theology was the centre, the vivifying force of all scientific life, as *scientia universalis* embracing all other branches of knowledge, giving them aim and direction, setting them well-defined limits, reducing them to purely secondary positions. Particularly did this hold true of philosophy which, as the hand-maid of theology, without daring to attack established tenets, had the task laid upon it of bringing, by means of the scholastic method, gradually petrified into mere technicality, the dogmatic content into harmony with natural reason, of evolving an organised system after reconciling existing contradictions or overcoming rationalistic difficulties. Theology and philosophy shared alike both teachers and pupils, methods and books. In the endeavour to impart an ecclesiastical character to philosophy, the goal aimed at was the reconciliation of peripateticism, the highest development of thought uninfluenced by revelation, with doctrine; Aristotle with the Fathers, by which it was hoped most effectively, most strikingly to combat all the heterodox tendencies attaching to the great pagan philosopher, as may be seen in the systems of Alexander of Hales, Bonaventura, Albertus Magnus and Thomas Aquinas. Aristotle, who, according to scholastic interpretation, afforded the strongest support to the establishment of a concordance between knowledge and belief,¹ was elevated to the rank of an authority who took second

¹ Only after long intellectual strife did Aristotle become recognised by the Church as the "Philosopher" *par excellence*. In the first decades following the introduction of his physical, metaphysical and ethical writings in the garb of Arabic interpretation, the study of Aristotle was viewed by the Church with a certain jealousy and it was even in part forbidden, more especially since the incompatibilities with the Catholic views of life appeared insuperable, and afforded opportunities for heresies of the most dangerous kind. The interdicts, however, could not check the enthusiasm for the new, clear light of reason, and the doubts of the Church vanished with proof of the fact that the dangerous part of Aristotelianism could be removed and that it was even capable of being made to serve the purposes of ecclesiastical scholarship. Even the last published edict of suppression (1231) conveyed the idea that its repeal was intended, in 1233 the forbidden books might be read in Toulouse, from 1234 onwards they belonged to the regular course of study in Paris. Alexander of Hales, Albertus Magnus, and Thomas Aquinas in particular, henceforward raised Aristotelianism to its place of authority in clerical circles, by simultaneously combating certain opposing neo-Platonic, Arabic expositions. The method by which the Church succeeded in checking a tendency at first not altogether groundlessly held to be inimical, and in

place only upon questions of dogma to the clerical writers, but surpassed them upon scientific questions. Under the influence of the Stagirite also the always pronounced encyclopædic tendencies received a rationalistic trend not previously so well defined, which manifested itself in the extension of the scholastic method from theology and philosophy to other subjects. It is clear that subjection to a method which promoted dialectics to the position of ultimate appeal even in practical affairs, which was based, not upon observation and analysis of phenomena, but upon *a priori* conclusions, which bowed to authority, which made a complete and harmonious cosmic system its chief goal, even at the expense of experience, could not but be a heavy yoke for science, a burden which was bound to hinder any real advance. No less insalutary for natural science was the tendency to convert physics into an appendage to metaphysics, to view nature less as an object in itself than as a manifestation of the supernatural world—the allegorical, symbolical conception of the objects and phenomena in nature as it had already appeared in the Physiologus. The creations of poetry, music and the plastic arts were inspired by the ecclesiastical spirit of religion and the transcendental, allegoric conception of the world, the idea of the “*Civitas Dei*”, the subtle construction of the individual from dominant general ideas, found most splendid embodiment in the grandiose Gothic cathedrals, towering high upon narrow foundations. These, which in style and technique appear to rise superior to earthly conditions, convey in their assemblage of graceful forms, the impression of some great organism turned to stone. Just as ecclesiastical philosophy tyrannised over secular science, so did architecture compel to its service sculpture, which was reminiscent of the most brilliant epochs in classical style and purity, even painting, to the detriment of its own development, being included.

Like every other age the thirteenth century lacked any really homogeneous civilisation, and not a few phenomena of religious, scientific and artistic, social, political and economic life sprang from those undercurrents which offered a sharp contrast to the hierarchical and ascetic system, to the spiritual cosmic conception and to feudalism. In these must be included the religious but anti-clerical agitations of Cathari, Waldenses, Albigenses, etc., the neo-Platonic-Averroistic, pantheistic tendencies of many scholastics, the awakening of the conception of nationalism as opposed to clerical universalism, the development of lay poetry which extolled popular ideals deriving, if dimly, from the heathen past, etc.

It cannot be denied that the scholastic epoch in its wealth of ideas, in its knowledge garnered from Arabic literature, but especially in the scientific form of its treatment of these, far transcended the precedent stages of development of Occidental medicine. These advantages, however, are as nothing compared with the drawbacks of a method which looked askance at the testing by experience of its fundamental principles, endowed tradition with infallibility, sought by the artifice of sharp-witted definitions and conclusions to convey the impression of knowledge, and choked intellectual activity and dispassionate observation with dazzling dialectics. Technical dexterity in differentiation and argumentation, in commentary and disputation was cultivated in place of straightforward clinical investigations,

keeping it within bounds, represented a victory, gained with spiritual weapons, far more glorious than that by which the Inquisition overcame heretics. A circumstance highly favourable for the independent interpretation of Aristotle, and therewith for recognition of his doctrines, may be found in the appearance of new translations direct from the Greek, such as were produced or at least inspired in the thirteenth century by Robert Grosseteste, Bishop of Lincoln, John Basingstoke and William of Moerbeke. Thomas Aquinas, in contrast with Albertus Magnus, founded his commentaries mostly upon these.

with an answer ready for every question, and for every newly-risen problem arguments cunningly drawn from the book-wisdom of Aristotle, Galen or Avicenna. The dialectic method, which was fundamentally confined within a vicious circle of preconceived opinions based only upon authority, could be of little service to a science where much if not everything should be dependent upon experience. Medicine was bound from its very nature to suffer more than other technical subjects under the oppression of scholasticism, since these were either more strictly demarcated and to a certain extent already followed well-defined lines, or else through the relative simplicity of their objective at least stimulated the powers of observation in certain individuals in spite of all doctrinaire bias. Whilst mathematics and geometry (Leonardo Fibonacci, Jordanus Nemorarius, Robert Grosseteste), astronomy (Alfonsine tables, Sphaera materialis of Holywood or Sacrobosco), mechanics, optics (Peckham, Roger Bacon, Witelon), chemistry or alchemy, mineralogy, botany and zoology (Albertus Magnus), climatology and geography (Giraldus Cambrensis, itinerary of Plano de Carpini, Rubruquis, Marco Polo) in the era of advanced scholasticism following the Arabs showed great additions to knowledge, the same could hardly be said of medicine at this era, and even though men above the average were not lacking, none were forthcoming in this branch of science in any way comparable with an Albertus Magnus as an observer of nature, with a Roger Bacon as an investigator.

Although the impression remains ineradicable that the intellectual endeavour of the thirteenth century was mainly concentrated upon amplifications of traditional *a priori* assumptions and their logical proof, the fact must not be overlooked that much strenuous work was done in adding to the store of technical knowledge and that with a success which, in certain subjects and in view of contemporary conditions, can only arouse in us the greatest admiration. The main incentive to such praiseworthy endeavours and achievements lay indeed in the desire of scholasticism to establish supersensual doctrinal tenets by processes of reason through knowledge of earthly matters of science and knowledge. Anxious, far-reaching effort, however, here and there resulted in the secondary means becoming an end with an independent purpose.

The best insight into the natural philosophy of the schoolmen is afforded by the writings of Albertus Magnus (1193–1250) and the colossal encyclopædia of Vincentius Bellovacensis, of whom one deserves the title of the Aristotle, the other of the Pliny of the thirteenth century.

Albert of Bollstädt, called Albertus Magnus (on account of his encyclopædic learning also Doctor Universalis), was born in 1193 at Lauingen in Swabia, studied in Italy, in his thirtieth year joined the Dominican order, and up to a great age laboured with ceaseless industry as a teacher and author of unusual productivity, in spite of many other calls upon his time. He was not only a light of theology and scholastic philosophy, but was in a high degree instrumental in the advancement of natural science upon which, from his student days onward, he brought to bear a keen interest and rare comprehension. Many legends are associated with his great knowledge of nature, which to his contemporaries and followers seemed uncanny and which earned for him the title of magician. Of the extraordinarily numerous works of Albertus Magnus not a few deal with scientific subjects and questions, the tendency being on the whole noticeable to make his contemporaries familiar with the doctrines of Aristotle, which in those days was synonymous with an introduction to natural philosophy itself. “My

purpose in regard to natural science", says Albertus in his introduction to his physics, "is to the best of my powers to comply with the request of the members of my order to write them a book upon nature, wherein they may at the same time correctly understand the writings of Aristotle." This adherence to the Stagirite in scientific matters was only a part of the great task which Albertus had set himself, viz. exhaustively to elucidate all the writings of Aristotle and to allow peripatetic conceptions to permeate scholasticism, whilst it accurately met the requirements of the age, which without competent leaders had not so far found its way amid the mass of newly disclosed facts and thoughts. Albertus therefore—as is shown by the similarly sounding titles—published only paraphrastic treatises upon the corresponding works of Aristotle and attempted, where these had been lost, himself to write the missing parts in the spirit of the Stagirite. In spite of his confessed adherence to the main views of the master, Albertus succeeded in an often surprising manner in manifesting a certain independence, which crops up in his "Digressiones", and that, not alone in the shape of criticism upon abstract elucidations, but, what is of more importance, in the form of original experience and observation, which had doubtless accrued to Albertus upon his pedestrian wanderings throughout Germany as a provincial of his order. This independence in observation—an uncommon phenomenon in an age of purely book-learning—was in the first instance beneficial to zoology and botany, to a less degree also to climatology, mineralogy, chemistry and physics. Although Albertus was in his fundamental views a rigid upholder of the ecclesiastical theory of life, although he may often have been too readily led away by superstition, he nevertheless distinguished far more clearly than his predecessors and most of his contemporaries between the metaphysical and that which is within reach of natural science. In a theological treatise he commits himself to the remarkable statement that whilst in doctrine of fact and morals Augustine is to be considered a higher authority than the philosophers, in questions of medicine, on the other hand, Galen and Hippocrates, in questions of natural philosophy, Aristotle, are to be relied upon; in another place, indeed, he even casts doubt upon the general value of authority in the profane sciences and rejects it in favour of experience as the only reliable criterion. In relation to medical subjects, the extracts, scattered throughout many of his works, dealing with anatomy, physiology and psychology, are of interest. Albertus also wrote upon the healing virtue of plants and stones, but dealt little with practical medicine (with the exception of the composition "De secretis mulierum"). Nevertheless his influence as the introducer of Aristotle upon the scientific foundation and method of medical education was a great one.

With Albertus Magnus the endeavour amongst the schoolmen to make the study of Aristotle the starting-point of empirical investigation into natural phenomena died out almost completely; the problems of dogmatism, metaphysics, ethics, politics, etc., exclusively held the field. Even Albertus' greatest pupil, Thomas Aquinas, left the natural philosophy of the Stagirite uncommenced and for the most part contented himself, when the elucidation of scientific questions was called for, with merely repeating his master's teaching upon these subjects.

The works were almost exclusively of the nature of encyclopædiæ with no speculative tendency, in which natural science found its due representation by the more or less uncritical accumulation of diligently compiled book-lore. These compilations were indeed of no small value in the propagation of knowledge in wider circles, and their contents prove the great progress which had been made since the introduction and study of the Aristotelian and Arabic writings.

The most important of these encyclopædiæ in volume and importance is the *Speculum majus* of the Dominican, Vincent of Beauvais (d. 1264), who occupied the post of "Lector" ¹ to Louis IX. and who collected, with marvellous industry, the entire knowledge of the period into a well-ordered, easily comprehensible form. This immense work, a compilation from many hundreds of authors, is divided into three main parts, *Speculum naturale*, *doctrinale*,

¹ He was known as a "familiaris" of the royal family, had to superintend and make additions to the famous library of the king and give general directions for the education of the royal children.

historiale, the first two of which are full of interest for science and medicine. The *Speculum naturale*, in 33 books with 3740 chapters, deals with God, angels and nature in general, on an old system of subdivision, according to the six days of the Creation. In the sections dealing with mankind are discussed the powers of the mind and their functions, the structure of the human body, conception, pregnancy, birth, nourishment of the child, etc., with extracts from all the important authors of antiquity; the compiler himself stands relatively in the background, but does not entirely refrain from here and there advancing his own views. The *Speculum Doctrinale*, beginning with *pædagog*y, gives a representation of all branches of knowledge and arts in the following order: grammar, logic, rhetoric, poetry, ethics, economics, politics, law, mechanical arts and industries, medicine, natural science, arithmetic, music, geometry, astronomy, metaphysics and theology.

Medicine, which, on account of its dual nature, takes its place between the practical arts and the theoretical sciences, is treated with especial detail—dietetics, general therapeutics, physiology and pathology.

A much wider circulation was achieved by a more superficial, uncritically put together scientific encyclopædia which had as its author an English Franciscan monk. This was the "*De proprietatibus rerum*" of Bartholomæus Anglicus. The contents are derived from some 150 authors, of whom Aristotle plays the chief rôle. In judging of this it must be borne in mind that the author had in view nothing more than a compilation, a fact upon which he lays stress in the preface as well as in the epilogue, whilst it must be remembered that in his work his principal intention was to pave the way for a better understanding of the scriptures in relation to technical subjects. The same standard applies to the compilation of the Dominican Thomas of Cantempe (1204–1280), a celebrated pupil of Albertus Magnus, a much-read work in 20 books, "*De natura rerum*".

Since Albertus Magnus remained without a true successor in the domain of natural science, and never broke the bonds of the prevailing mode of thought, but only succeeded in proving the possibility of a reconciliation within certain limits between unbiassed observation of facts and scholasticism, it cannot be a matter for surprise that the premature movement in favour of the emancipation of scientific investigation from dialectic oppression, of an exact foundation upon a basis of observation and experience by the aid of mathematics and experiment, should find no support, but should be met by misunderstanding, even by embittered enmity. It was the English Franciscan, Roger Bacon, who once more initiated this movement, a truth-seeker and pioneer of comprehensive knowledge and intuitive perception, a thinker of unyielding austerity of thought, who paid for his great superiority over his age with a lifetime's martyrdom, but whose name can never be erased from the annals of the intellectual development of mankind so long as the light of scientific freedom shall shine.

Roger Bacon—called, on account of his marvellous knowledge, Doctor Mirabilis—was the scion of a distinguished, well-to-do family, and was born about 1210 or 1215 at Ilchester, in Somerset. He studied with unusual zeal at Oxford, from the first justifying the highest expectations, later in Paris, where after a many-sided education he is said to have obtained his doctor's degree in 1247. Although he displayed rare skill in dialectics, he found no real satisfaction in the hair-splittings and verbal controversies of scholasticism, but, seeking solid knowledge of facts and stimulated by eminent, like-thinking investigators, pursued, in addition to linguistic, by preference mathematico-astronomical studies and particularly physico-chemical experimental investigations, the latter of which swallowed up a large amount of money (£2000). It is uncertain whether Roger Bacon entered the order of Minorites in Paris or only after his return home about 1250, but everything points to the fact that he not only pursued an active career in Oxford as an investigator, mostly along practical lines, but was also a public teacher—no doubt in unconventional manner.¹

¹ In order to demonstrate the foundations of Roger Bacon's greatness, the fact must be emphasised that study of mathematico-scientific subjects and, in conjunction with this, distaste for scholastic polemics characterised the school of Oxford at that time—traits which had earlier been noticeable in the Englishmen Adelard of Bath, Alexander Neckam and Alfred Sershall. In the first

Unfortunately the fruitful and almost unique influence of this great man, who aimed at a reform of science and education, was only too early interrupted. Envy and unpopularity which followed on the heels of initial admiration and which grew as the result of certain utterances of Bacon's upon the ignorance of eminent scholars and upon the immorality of the monks, suspicion which caused his incomprehensible scientific researches and superior knowledge to be looked upon as devilish arts, culminated eventually in serious charges which, though for a while repelled, finally found credence amongst his superiors, after Bonaventura had succeeded to the generalship of the Franciscan order. Bacon was taken in 1257 from Oxford to the House of the Order in Paris, where he had to submit to various penalties and was placed under strict supervision, whilst from this time onward he was deprived of freedom to commit to writing his ideas and discoveries. A last ray of hope penetrated to the investigator thus doomed to silence when the newly elected Pope Clement iv., who in earlier days had been friendly inclined towards him, in 1266 extended to him in profound secrecy the permission to elaborate his views and plans for reform and to submit them by way of justification. In spite of the obstacles in his way, Bacon, with the help of his friends, produced in fifteen months his chief work, "*Opus majus*", and caused it, with other writings, to be taken to the Pope by a pupil admitted to all the knowledge of his master. Later, the introductory and elucidatory writings, "*Opus minus*" and "*Opus tertium*", also came to Rome. Clement iv. died some three months after the arrival of the works and the Papal chair remained for some years unoccupied. How Bacon's lot was bettered—the fact may be assumed—we do not know with certainty, but we do know that his enemies came once more to the front with their accusations and, moreover, that the embitterment was raised to its highest by a new work published in 1271 ("*Compendium studii philosophiae*"), in which the intellectual and ethical depravity of the clergy and monks was scathingly unmasked. In the year 1278 the general of the Franciscans, Hieronymus of Ascoli, as president of the tribunal of the order held in Paris, sentenced the unhappy Bacon, "*propter suspectas novitates*", to imprisonment, and at the same time placed a ban upon the reading of his works. In this strict confinement Bacon languished, even when Hieronymus, under the title of Nicholas III., had become Pope and in spite of the attempt to pacify him by the dedication of a small treatise upon the art of guarding against the disabilities of old age. Only after the death of Nicholas iv. (1292) was Bacon, after fourteen years' captivity, a broken old man, released through the intercession of men of note, by the more leniently disposed general of the order, Raymond Ganfred. His last work, "*Compendium theologiae*", bears this year's date; whether he died in 1292, or not until 1294, as is also stated, is undecided. The oppression of the great thinker had this lamentable result, the influence of which was felt long after his death, that very few only of his writings, and those not the most important, enjoyed a wide enough circulation to influence intellectual development as a whole, and that his memory, up to the eighteenth century, lived under a cloud, associated with the history of astrology, alchemy and the magic arts. Only a part of Bacon's writings are so far available in print.

The known writings of Roger Bacon—particularly the *Opus majus*, *minus* and *tertium*¹—

half of the thirteenth century the liberal theologians Robert Grosseteste, Bishop of Lincoln, and the Franciscan Adam of Marisco were the foremost representatives of this tendency, men who exerted the strongest influence upon Bacon. Grosseteste, who was more of a theologian and scientist than logician and metaphysician, laid chief stress, as did Bacon later, upon knowledge of the learned tongues on the one hand (he rejected the inferior Latin translations of Aristotle and produced new ones directly from the Greek), and on the other hand, upon mathematics and natural science (his work "*De physicis lineis, angulis et figuris*" was one of the most important foundations for Bacon's doctrines on physics, and particularly optics). Besides the two above-named thinkers, Bacon was noticeably influenced by the Picard Petrus of Maricourt, with whom he became acquainted in Paris and who distinguished himself by inexhaustible zeal and a rare dexterity in experimental research upon physics and alchemy.

¹ From the first chapter of the treatise "*Communia naturalium*" it may be gathered that Roger Bacon had had in view the publication of a colossal encyclopædia in four chief parts (grammar

prove conclusively that this enlightened thinker was no mere polyhistor but that he was centuries in advance of his time in clearness of conception, critical insight, scientific independence and breadth of vision, even if he did not entirely succeed in escaping many of the prejudices of the age. To do justice to his many-sided, really great personality would be beyond the scope of this work; what must be emphasised is that Roger Bacon untiringly opposed scholasticism at the time when it was at its zenith, and that he branded as a most mischievous error its one-sided, dialectical methods with their profound contempt for realities. Roger Bacon, in opposition to the great mass of his contemporaries, did not look upon ancient Arabic tradition as the final expression of knowledge, as an axiom of incontrovertible value, but only as an expedient requiring substantiation, as a starting-point for future research. In the interests of a more solid foundation he encouraged first and foremost the assiduous study of languages, over and above Latin, in order that the Bible and the older authors might be used as sources of information in addition to second-hand commentaries and defective translations. He held the causes underlying the deplorable state of science to be adherence to authorities of no weight, rooted habits of thought, and prejudice on the part of the uneducated masses, but in particular the universally prevalent vanity, leading to parade of pseudo-knowledge. The condition most essential to progress is attention to the neglected mathematico-scientific studies, which form a safe, reliable foundation for the other branches of knowledge and bear rich fruit for practical life. Bacon attached to the far more convincing "experimentum" as basis of knowledge a much higher value than to the "argumentum". Mathematics, observation, experience appeared to him as the sole certain foundations of natural science. It is a notable fact that Bacon, unlike so many of his predecessors, did not always attempt scientific investigation in concrete instances only, but installed experimental research *per se*, the "scientia universalis", as an independent methodological principle, in order to do justice to its outstanding importance.

The additions which the writings of Roger Bacon made to medicine in the strict sense of the word are not important, but the fact requires mention that, like most of his contemporaries, he attached great importance to astrology and expected much for medicine from alchemy, which, however, with him was nearly synonymous with chemistry; in particular he confidently believed that it would be possible, by the help of the last named, to obtain the elixir of life.¹ Bacon refers the superstitious proceedings in medicine, like many other magic arts, to natural origins, and justifies the subsequent use of them on the part of physicians from the standpoint of psycho-therapeutics. On the whole, however, the impression cannot be avoided that the great thinker, the forerunner of inductive research, is, in the domain of medicine, deserted by his usual soberness and critical faculty—a proof of the fact that medicine, in its striving after exact method, had to encounter incomparably greater difficulties than the natural sciences, especially the inorganic.

A glance at Western natural philosophy in the thirteenth century suffices to show that only in those subjects was real progress manifested which were intrinsically descriptive or which were pursued upon the lines of a mechanical conception of Nature. As with the Arabs, however, in most subjects the overwhelming influence of peripatetic sophistry predominated, the blindly

and logic; mathematical sciences; physics; metaphysics and moral philosophy), to which the "Compendium studii philosophiae" was doubtless meant to be the introduction. Persecution and imprisonment prevented its execution. The *Opus majus* is only to be considered as a greatly conceived apology written in defence of the author's plans for the reformation of science and to insist upon the value of their realisation for ecclesiastical and moral purposes.

¹ The problem of the prolongation of life forms the content of the treatise upon old age. It is, moreover, to be noted that Bacon, despite all credulity, clings to the belief that the span of life could not be prolonged beyond a certain degree which is fixed, on the one hand for mankind in general, on the other for the individual through inherited germ properties.

accepted principles of which were a stumbling-block in the way of general causal investigation.

It is hardly surprising, in an age which changed admiration of the Stagirite into worship, that medicine should have followed the example afforded by the natural sciences and, fighting for scientific recognition, should have sought amalgamation with Aristotelianism, the more so since the model doctrinal systems of Galen and the Arabic masters were essentially built up on peripatetic foundations and owed their entire structure to Aristotelian dialectics, at any rate so far as physiology and general pathology based upon it were concerned.

Herein lies the key to an understanding of the deplorable state of medicine following upon the decay of Salernitan tradition, and of the barren picture of the scholastic era presented us on the whole by medical literature. For it is only by means of a mental picture of their chief end and aim—a scientific foundation for medicine by means of Aristotelian philosophy—that it becomes comprehensible why the Western physicians so willingly subjected themselves to the yoke of the Arabic theorists, those skilled interpreters of peripatetic philosophy, why they uselessly squandered their best energies in laborious compilation and comparison of authoritative doctrines, in the Sisyphean labour of attempting to find subtle solutions of the dilemmas that presented themselves, in the elucidation of problems never set by Nature herself, and why their original observations and independent experience which here and there showed themselves were lost in a wilderness of subtleties devoid of any real meaning.

Whilst the fundamental principles of peripatetic philosophy, with their amplifications at the hands of the Arabic commentators, represented the general connection between natural philosophy and medicine, a more intimate relationship sprang up between certain of their branches. A favourable influence was exerted in this respect upon dietetics and *materia medica* by the zealous study of botany, but an unfavourable one by the influence exerted upon prognostics and therapeutics by astrology, which was regarded as an exact science by most of the leading men of this era. Alchemy also, widely studied throughout the Christian West in the thirteenth century, was not without its influence on medicine and it instilled into the medical mind the illusion of supposed panaceas, although it was to some extent beneficial to pharmacy.

It is not surprising, in face of a theory of life wherein the most barren intellectualism had a place alongside the greatest fervour of mysticism, that superstitious customs of all kinds, magical methods, indigenous or borrowed from the East, found their way increasingly into medicine, but it appears as

though some at least of the scientifically educated physicians made use of these only from a psycho-therapeutical point of view.

A variety of extrinsic and intrinsic determining influences, numerous, and for the most part unresolved, factors, made of the thirteenth century an epoch, not of true progress from the standpoint of medical evolution as a whole, but rather an extremely important and disturbed transition period of Occidental medicine, which did not pass under the petrifying influence of Arabism until the last decades of the century. This was the dominant influence upon the theory and practice of medicine until the end of the Middle Ages. It will therefore suffice, since the opportunity will arise later of entering more fully into the contents of contemporary science, to bring under review only the most important medical writings and the most salient personalities.

The most striking occurrence which next manifests itself is the cessation of the literary productivity of Salerno at the end of the twelfth century, which, in addition to unfavourable external conditions, is dependent upon the fact that the famous school had played to the end the part allotted it in history, although its reputation was not overshadowed by other seats of medical learning until the middle of the thirteenth century. The little that has come down to us of Salernitan literature of this period consists of revisions of earlier publications or deals solely with therapeutics, showing no trace of any fresh scientific spirit. It was, nevertheless, an important fact that the school, the less it became able to maintain its position in the van of medical theory, devoted itself the more to the cult of botanico-pharmalogical study, to dietetics and balneology, whereby it was ensured a protracted span of influence.

Even more than in the *Civitas Hippocratica* itself was the attempt made outside Salerno upon French soil, to give a more or less pronounced Arabic colouring to the old simple traditions, particularly in the domain of semeiosis (uroscopy, pulse examination) and pharmaco-therapy as well as in doctrines of disease, an attempt which had already been undertaken at the close of the twelfth century. As illustrations of this tendency may be taken the writings of Ricardus Anglicus, also the author of an anatomy, of Gualtherus Agulinus, an imitator of Gilles de Corbeil; in them prevails an eminently practical spirit and that spontaneous literary style which characterised the Salernitans on the one hand, and on the other the Arabs introduced by Constantinus (*e.g.* Isaac Judaeus, Ali Abbas). The last also served as the chief source of inspiration for Petrus Hispanus; this Portuguese physician, philosopher, and later, pope, gave his name to a formulary, highly esteemed and widely circulated in the Middle Ages and even later,

more popular in its aim than scientific in its pretensions, the "*Thesaurus Pauperum*".

Sharply distinguished from this work is the "*Compendium Medicinæ*" of Gilbertus Anglicus (the first English author of European repute), whose career extended into the first half of the thirteenth century. This work, also called "*Laurea Anglica*", aims in principle at establishing a synthesis upon broad lines of Salernitan with Arabic medicine, but he is too ready to make concessions to the latter and becomes wearisome to the reader through theoretical subtleties in which much good observation and independent experience are nevertheless entangled. The author from certain passages appears more constrained by the spirit of the times and by his surroundings in the direction of polypharmacy and adoption of superstitious proceedings, than by his own convictions (*e.g.* in favour of rational and dietetic therapy).

The best purview upon contemporary materia medica, which was drawn from the Salernitan Antidotarium (Nicolaus Praepositus), from Galen and also from the Arabic authors, is provided by the authoritative and compendious writings of Johannes de Sancto Amando, who was master of a genuinely lucid and well-ordered descriptive style and who only falls a victim to unavoidable subtlety where the subject itself demands it. His contemporaries owed him, amongst other things, a collection of the most important extracts from Galen and Avicenna, arranged in lexicon form, as well as a terse contents-table to the chief Hippocratic and Galenic writings—which materially simplified scholastic study of their voluminous and confusing contents.

At the close of this period Simon Januensis sought to meet the necessity for a critical revision of the materia medica, which owed its origin to many different sources, and for an improvement in the confused nomenclature, his "*Clavis Sanationis*" having a foundation of botanical as well as linguistic study.

Ricardus Anglicus of Oxford, from 1227 onwards body-physician to Pope Gregory ix., after the death of the latter, returned to Paris, where he became a prolific author; he died in 1252. Amongst other works he wrote an anatomy in 44 chapters, quoting Hippocrates, Aristotle, Galen, Avicenna.

Gualtherus Agulinus, educated at Salerno, presumably a French physician of the beginning of the thirteenth century, was the author of a "*Compendium urinarum*", in which the deposits and the colours of the urine are enumerated according to their diagnostic significance.

Petrus Hispanus, born in Lisbon at the beginning of the thirteenth century, studied in Paris and Montpellier, had an exceptionally brilliant ecclesiastical career, ending in 1276 by ascending the papal throne as John XXI. He was the author, not only of philosophic, but also of a series of medical writings, which were very widely circulated. To these belong the "*Thesaurus pauperum*" sive "*Summa experimentorum*", a conglomeration of formulæ from different authors against all kinds of complaints, intended to serve the needs of the poor; "*Commentaria supra librum diaetarum universalium et particularium*" and "*De urinis*

Isaacii", "*Liber de oculis*" or "*Breviarium de egritudinibus oculorum et curis*". Except operations for trichiasis, pterygium and cystic tumours, ophthalmic surgery is a blank, but credit is due for the attempt to suppress, as far as possible, superstitious methods.

Gilbertus Anglicus, "*Doctor desideratissimus*", is supposed, after study in England, to have visited the most renowned foreign schools, and, for part of his life at least, practised in France. His chief work is "*Compendium medicinæ tam morborum universalium quam particularium, nondum medicis sed et chirurgicis utilissimum*". It is noteworthy that in isolated passages there is a tendency to follow Hippocrates in his simple expectant method of treatment; this is, however, coupled with the warning that such treatment would appear highly peculiar to his contemporaries. Here and there may be found original observations, but lost in a waste of hair-splitting theoretical discussions. In therapeutics the principal part is played by 200 complicated antidotes, dietetic measures, and also many surgical procedures; of the last, however, he says that he only includes them by way of completeness, not from inward conviction. Amongst the subjects dealt with are: leprosy (anæsthesia and other nervous symptoms, heredity, danger of contagion), as well as smallpox and measles (the differential diagnosis was held to depend upon the elevation above the skin in the case of the former); Gilbert emphasises the danger of infection, and mentions amongst methods of treatment that one which consisted in wrapping the patient in red cloths. In "*Hygiene for sea-travellers*" occurs the recommendation to purify drinking-water by distillation if no other means is available.

Johannes de Saneto Amando (Jean de Saint-Amand), one of the most learned physicians of the day, taught transitorily in Paris and displayed great industry as an author as well as a physician. Simon Januensis (Simon of Genoa), physician to Pope Nicholas IV., bequeathed as the fruit of nearly thirty years' work a dictionary of materia medica ("*Synonyma medicinæ*", or "*Clavis sanationis*"), the purpose of which was to simplify and elucidate the chaos of nomenclature. Simon took his stand upon botanical investigations, which he pursued on his extended journeys in various parts, upon laborious comparisons of Greek, Arabic and Latin writers as regards the names with which identical objects were denoted by him.

Although some of the above-mentioned authors—notably Gilbertus Anglicus—were by no means deficient in subtle interpretations, in formalism of expression, yet the real originator of that dialectic, disputative mode of treatment of medical subjects which justified the term "scholastic" must be looked for in the person of Thaddeus Florentinus (Taddeo Alderotti), a man with whose teaching and literary achievements the earliest fame of the medical school of Bologna is bound up.

He, more than any other, opened wide the portals of medicine to Aristotelian dialectics and established Aristotelian physiology as the chief foundation of medical theory; through him medical education and research were given a fixed standard in the scholastic modes of proof.¹ To have introduced a new epoch of medical literature, although no happy one, remains his achievement.

Taddeo Alderotti, born in Florence in 1223—Thaddæus Florentinus—came of a poor family, grew up under the most unfavourable conditions, and only in adult life devoted himself to the study of philosophy and medicine in Bologna. His education completed, he commenced teaching there and continued his career throughout many years, aiming at logical development of the art of healing, and displaying a mastery of his subject which earned him

¹ According to the scheme: assertion, evidence, objection, counter-objection, solution.

from his contemporaries the honourable title of "Magister medicorum". His reputation did not, however, rest solely upon his eminent learning, but also upon his success in practice, which made him a much-sought-after adviser, even sent for from long distances, particularly in wealthy aristocratic circles; the latter circumstance enabled him to amass a greater fortune than was strictly legitimate,¹ although this, no more than his other weaknesses, affected his wide popularity. He died in 1303 at an advanced age, after having made testamentary provision for several philanthropic foundations whereby to perpetuate his name.

A perpetuation of the Salernitan tradition, with its adherence to that of Greece, can be seen in the fact that Thaddæus (with exception of the *Isagoge* of Johannitius) took as the objects of his interpretative art only Hippocratic and Galenic writings—that he preferred scanty existing translations from the Greek (Burgundio of Pisa) to the inefficient versions of Constantinus, but the spirit and style of his commentaries betray only too clearly the teaching of Avicenna's *Canon* and are astonishingly reminiscent of the logical glossographical method brought to so high a pitch of perfection by the Bolognese legal family of Accorsi.²

It can readily be imagined that, under prevalent conditions, his teaching, so different from that which preceded it and having so great an air of scientific reality, met with great approbation, and subsequent medical literature affords proof that Alderotti succeeded in attracting a whole series of pupils as notable commentators; it is, however, more satisfactory from our point of view that, to all appearance, in spite of marked predilection for the theoretical, he did not entirely neglect the practical side in investigation and instruction, and in this connection even called into being a new form of medical literature, viz., the "*Consilia*", based upon individual cases of disease.

Thanks to the timely tendency inaugurated by Thaddæus and further

¹ When Pope Honorius iv., who had called him in, gave expression to his astonishment that Alderotti should demand a daily honorarium of 100 gold pieces, he answered that minor princes and nobles did not demur at paying 50 or more. In order not to appear penurious the Pope, after his cure, is said to have paid him no less than 10,000 gold pieces.

² It is no accidental circumstance that scholastic medicine should have attained its highest development in the place where the art of juristic interpretation celebrated its greatest triumphs, in Bologna, for, under the influence of such surroundings, it was no great step for medical research and medical tuition to become imbued with glossographic methods, whereby the false assumption passed as true that the only question was that of the correct exposition of the "*Littera scripta*", that to ancient Arabic literature was to be ascribed the same authoritative, unshakable significance that the Books of the Law of Justinian actually possessed for lawyers. As these dealt with the legal authorities, so did Thaddæus deal with the Aphorisms, the Prognosticon of Hippocrates, etc., by providing them with glossaries, to which were soon added formal quæstiones, disputationes, recollectiones and quodlibetationes. Fundamentally it was the juristic spirit, awakened by the resuscitation of the Roman Law, which—as Roger Bacon complained—dominated the theology of the thirteenth century, it was juristic formalism which exercised so great an influence upon the architecture of the theological edifice. In Italy itself, where speculative theology had no eminent representative—leading theologians of Italian parentage like Peter Lombard pursued their avocations in Paris—the scholastic method, so far as it bore upon the widely pursued study of law, was the pattern for other branches, especially for medicine.

developed by his disciples, Bologna overtook Salerno, which continued to move along the old grooves. The true significance of the school of Bologna upon evolution in general is not, however, to be sought in the increasing numbers of learned commentators that it sent out, but rather in those efforts which under happier conditions furthered those endeavours which had long before been initiated in Salerno, viz., the pursuit of anatomical study and the scientific advancement of surgery (cf. pp. 33, 34), two phenomena which shed a ray of light across the dark picture of mediæval medicine.

The surgical fame of Bologna is decidedly older than the medical, and is in this era indissolubly linked with the names of Hugo of Lucca and Theoderic, who made thoughtful use of inherited early Arabic traditions, and progress by means of a simpler, expectant and non-suppurative mode of treatment of wounds,¹ as well as by limitation of the use of the cautery and of mechanical over-interference (in the treatment of fractures and dislocations).

The enactments of Frederick II. placed the study of anatomy (zootomy) in Salerno and Naples upon a firm footing. The statement, however, that in 1238 an order was issued that every five years a human corpse was to be dissected in the presence of the physicians and surgeons, can hardly be otherwise than a later embellishment. The first traces of anatomical study lead back to the middle of the twelfth century. Thaddæus, who betrays in his later writings a comparatively good knowledge of anatomy, drew upon the Arabic authors and was certainly present at dissection of animals; whether he himself made use of the knife is uncertain. It is more than probable that the pseudo-Galenic work "*De anatomia vivorum*" was put together in Bologna towards the second half of the thirteenth century under his influence (mainly from Aristotle, secondarily from Galen), the truly scholastic style, the barbarous Latin and Arabic terminology point to this epoch. Whilst general anatomy and physiology are fully treated here, osteology and the cranial nerves are scantily dealt with; in the anatomy of vessels those upon which phlebotomy was habitually performed are almost alone mentioned. It must not be overlooked that according to many indications, as early as the thirteenth century in Italy, corpses were here and there opened in order to determine the cause of epidemic disease; a probable but unproved occurrence is the performance of inquests at this period. In the matter of forensic medicine, we only know for certain that following upon German legal customs, external investigation of corpses by competent physicians for the purpose of judging of the lethal or other nature of wounds had long taken place.

Hugo Borgononi, or, after his birthplace, Hugo of Lucca, was born in the middle of the twelfth century, practised in Bologna, accompanied the Bolognese crusaders in their journeys to Syria and Egypt and died, close upon 100 years old, before 1258. As a surgical practitioner he enjoyed a considerable reputation, educated several of his sons as physicians, amongst them being the subsequently famous Theoderic. Hugo himself bequeathed nothing in writing, but we learn amongst other things from Theoderic that he (the father) recommended the primitive form of narcosis by means of narcotic sponges (cf. p. 67), and practised a simple, non-suppurative form of wound treatment. He treated simple and compound injuries of the skull in a highly rational manner (simplicity, cleanliness, avoidance of over-interference, abstention of probing), also penetrating chest-wounds, empyema, abscesses, etc., and considerably simplified treatment by mechanical means in injuries of the extremities and

¹ The Salernitan surgeons aimed in the treatment of wounds at encouragement to suppuration, the Bolognese surgeons, on the contrary, recommended a desiccative method. The Salernitans based themselves upon Hippocrates (*laxa bona, cruda vero mala*), their opponents upon Galen (*Siccum sano est propinquius, humidum vero non sano*).

dislocations; in fracture of the ribs he attempted reposition with previously oiled fingers in a bath.

Theoderic of Lucca (1206-1298), son of the foregoing, embraced an ecclesiastical career, but in consequence of special permission was enabled to complete the medical education begun by his father, and even as Bishop of Cervia practised medicine in Bologna. This was so comprehensive and lucrative that he was able to leave a large fortune for charitable purposes. In spite of adherence to Greek and Arabic authorities his surgery gives evidence of a certain degree of originality, a result of his father's education, upon whom the author frequently relies. Theoderic is emphatic in support of a non-suppurative method of treatment of wounds; like his father he declares wine to be the best dressing. In the section upon hæmostasis mention is made of cauterisation, tamponage, ligature, and complete severance of injured vessels; in the treatment of fractures and dislocations the endeavour is manifest to substitute simple procedures for over-complicated mechanical methods. Mention is made of the method of stupefaction during operations by means of the narcotic sponge. The sponge was saturated with narcotic plant-juices (opium, hyoseyamus, mandragora, lactuca, etc.), dried and kept, being moistened before use with warm water. In various skin affections (scabies, pruritus) Theoderic made use of mercury, and noticed excessive salivation as a consequence. It speaks for his rational outlook that Theoderic emphasised the necessity of anatomical knowledge for surgeons and clearly recognised the worthlessness of many of the miraculous measures popular in his day.

In the conflict concerning the principles of wound treatment a prominent part was taken by William of Saliceto—the greatest surgeon that Bologna, and the thirteenth century as a whole, produced.

Saliceto was a man of comprehensive medical education, with a special predilection, a "*Specialis amor*" as he himself says, for surgical practice. The method which he wished to see followed in this is exhaustively and agreeably pictured in his "*Cyrurgia*". Although this contains no great novelties, yet the subject-matter is admirably arranged and enlivened by the narration of good observations and numerous instructive cases. Diagnosis and treatment are everywhere evolved with such quiet certainty, so clearly and purposefully, that one can picture the critically reflective mind, the skilled hand of an experienced, bold, but yet circumspect surgeon, trustful only of his own perceptions. In keeping with such a master is the comparatively terse descriptive style of the book, almost devoid of quotations. It is a matter of historical importance that Saliceto, as already Theoderic, brought the knife once more into repute in place of misdirected use of the actual cautery.

Saliceto was not only an eminent surgeon, he by no means neglected internal medicine, and in keeping with his own many-sided education, his purpose was directed towards promoting a reunion of the two branches. The advantages which might accrue to internal medicine from such an association, the influence of the surgical trend towards unbiassed observation in opposing the illusions of medical dialectics, these are best evidenced in the ample compendium of internal medicine which Saliceto published in succession to his surgery. This work—*Summa conservationis et curationis*—

shares indeed with other similar writings of this age a close adherence to precedent (and especially Arabic) literature, but is in many respects favourably to be distinguished from these, particularly so by a preference for a hygienic and dietetic attitude, by the not inconsiderable number of good clinical observations and by a descriptive method nearly free from scholasticism.

Guglielmo da Saliceto of Piacenza was born in the first third of the thirteenth century and was a pupil of Buono di Garbo. He lived and taught awhile in Bologna, lastly in Verona, where he had a post as city and hospital physician. He died probably in 1280.

Cirurgia.—Treatment of large incised wounds consisted in cleansing with oil, arresting hæmorrhage, suture, careful dressing, rest to the injured organs and suitable diet; when suppuration set in "*mundificativa, incarnativa*," etc. were brought into use. Injuries to the skull were treated by a very thick dressing in order to prevent harmful access of air; amongst sequelæ emphasis is laid upon crossed paralysis. A detailed and circumstantial account is given of arrow wounds, penetrating chest and abdominal wounds. Amongst diagnostic signs of fracture mention is made of crepitation. The only value attaching to the anatomy lies in the novel topographic mode of description; the contents are for the most part drawn from the erroneous assertions of earlier writers; the author does not appear to have practised human anatomy. The instruments employed for cauterisation were made of gold, silver, brass or iron; caustic drugs were at times used instead.

Summa conversationis et curationis.—Saliceto's advice upon behaviour at the bedside and in intercourse with the laity might hold good even to-day. The physician should be reflective, silent, with downcast countenance, giving the impression that all wisdom is contained in his mind. Friends and relations should be conversed with as little as may be, for the blame of foolish speech is not attributable to silence. The physician should hold himself aloof from all that might damage his reputation with the public. Visits to the patient should not be over-frequent, but only upon desire. Great care is to be taken in the supplying of narcotics; ordering abortifacients or measures to prevent conception is contrary to religion. The treatise on Dietetics and Hygiene constitutes a vade-mecum from the cradle to the grave which is even now worthy of perusal. It begins with an exceptionally careful hygiene of pregnancy and the first year of life. Daily bathing of the child is essential, smearing the anus with oil facilitates the passage of the fæces, the child's crying enlarges the chest and assists metabolism and therefore should not give rise to anxiety. At the end of the sixth year consideration is to be given to good mental and bodily training, bathing is important, wine is to be forbidden. After the fourteenth year greater freedom can be allowed in choice and quantity of food, and attention is to be paid to good air, regulated exercise and rest, avoidance of mental excitement, and to a certain degree of hardening. Saliceto indicates the necessity for a healthily-placed dwelling and a suitable sleeping apartment. Over-hot baths are harmful. Noticeable descriptions in the specialised pathology are those of melancholia and of "*durities renum*" as a cause of dropsy (? foreshadowing the symptom-complex of Bright's disease).

The great advances which were made in surgery during the thirteenth century in Italy were founded, not only upon the extensive practical application of the Graeco-Arabic heritage, but still more upon commencing independence of observation and experience, at least in individual cases and methods. The most important requisite for this development was ensured through the circumstance that the medical schools of Italy provided a scientific education for surgeons, and that these were enabled to occupy a social position in keeping with the dignity of their profession.

The influence of the great Italian masters fortunately did not remain confined to their immediate surroundings, but the only real colony of Italian surgery was established in Paris, where the legitimate surgeons in the middle of the thirteenth century, in order to safeguard their intellectual, social and professional interests, had banded themselves together into a corporation, the Collège de St. Côme, and were, thanks to their technical training, at least in part, prepared to adopt the art of operation in the strict sense of the term. To have communicated this to them, and thus to have laid the foundation of French surgery, with its subsequent brilliant developments, stands to the credit of the Milanese Lanfranchi, who was a disciple of the school of William of Saliceto.

As appears from the two chief works of Lanfranchi, the "*Chirurgia parva*" and the "*Chirurgia magna*," enlivened by a recital of cases, the herald of Italian surgery upon French soil followed diligently in the footsteps of his famous teachers, without, however, surrendering his own observation and his own independent judgement. Like Saliceto, animated by the dignity of his art and imbued by a rigid conscientiousness, he sought to establish surgery upon a scientific basis and to effect its reconciliation with internal medicine, whilst his sheet-anchor in surgical instruction was reference to concrete cases. "*Bona casuum narratio multum corroborat operantem.*" "*Nam omnis scientia quae dependet ab operatione multum corroboratur per experientiam.*" To a greater degree, however, than Saliceto Lanfranchi devoted himself to literary erudition, even to scholasticism, and an undoubtedly retrograde step is recognisable in the fact that he often displayed exaggerated timidity in face of major operations (*e.g.* herniotomy, lithotomy).

Lanfranchi, of Milan, the most notable pupil of Saliceto, practised first in his native city, from which, as a result of political disturbances, he was banished in 1290. Like many other Italian physicians he sought asylum in France and proceeded next to Lyons, where he wrote his "*Chirurgia parva*", then travelled, always practising his profession, throughout several provinces, finally to take up lasting residence in Paris. Here, in connection with his large practice, he taught actively and fruitfully, adding considerably to the reputation of the Parisian surgical corporation after his inclusion in the Collège de St. Côme. The novelty of his method of teaching consisted in the publicity of the operations, with which were associated instructive dissertations.

Chirurgia Parva.—After a short survey of anatomy and physiology, Lanfranchi deals with wounds and ulcers. Wounds are usually treated with a dressing in which "*pura clara ovi*" or the red powder is directly applied; suture was employed for large, gaping wounds. Amongst hæmostatic methods mention is made of digital compression and ligature of vessels. It is noteworthy that emphasis is laid on the influence of air upon pus production in wounds. Ulcers are divided into *ulcera virulenta, sordida, profunda, corrosiva, putrida, ambulativa* and *ulcera difficilis consolidationis*. Obstacles to the healing of ulcers are often to be sought in the seat of the lesion or in the after-effects of certain diseases. "*Cancer apertus*" is only to be attacked with knife or actual cautery when complete removal is

possible. Signs of fracture of the skull are a harsh, rattling sound on tapping the vault of the cranium with a small stick, a sense of pain on the part of the patient on plucking with the nails at a thread held between the teeth. The cerebral symptoms in fracture of the skull are excellently described. Lanfranchi opposes too frequent resort to trephining, which he only considers indicated in depression of the fragments and meningeal irritation. In the treatment of abscesses the humoral theory plays an important part in the shape of *evacuantia*, *repercuissiva*, *maturativa*. Lanfranchi adopts towards radical operation for hernia a carefully expectant attitude, he rejects nephro-lithotomy and only advises cystotomy when internal measures, sitz-baths, etc., fail. He recommends the same caution in *paracentesis abdominis* for ascites, maintaining that the operation is mostly performed in a routine fashion, without regard to the underlying disease and the individual conditions. In the technique of *venesection* longitudinal incision is generally recommended; thirty veins for its performance are mentioned; in addition to numerous indications, contraindications are emphasised in the case of children, old people, pregnant women, etc.

Whilst the art of surgery was in process of development in Paris, the Parisian medical faculty lagged far behind other medical schools in importance and in reputation, and from the scanty information at our disposal it is evident that the healing art had there entirely come under the oppressive domination of scholasticism, whilst practical instruction was greatly neglected.

The school of Montpellier, on the other hand, paid some attention to empiricism in research and instruction, a tendency which was followed with a more conscious aim after the most brilliant exponent of thirteenth-century medicine had exerted his influence upon the conditions of study in that place. This was the great Catalonian, Arnaldus of Villanova, one of the most singular and interesting personalities of mediæval times.

Arnold of Villanova was presumably born within the period 1234-1240, probably in Spain in the diocese of Valencia. According to his own statement he was of humble origin and grew up in a Dominican monastery. After a scanty elementary education he turned to the study of theology, languages and philosophy, but particularly to natural philosophy and medicine, with the utmost zeal. He probably studied chiefly in Paris and Naples, but certainly did not learn only from books, but enlarging his knowledge and broadening his experience by journeys, in intercourse with Saracen physicians, eminent contemporaries and with the people. He settled in Montpellier about 1299, where he not only practised but busied himself with teaching. Although Arnold practised as a physician in various towns in Italy, France and Spain, and aroused the admiration of his contemporaries as a medical author and alchemist, yet the mainspring of his actions in later life was diplomacy in the interests of Aragon and endeavours towards social reform. In the year 1299 Arnold, whilst ambassador of Aragon at the court of Philippe le Bel, came into conflict with the theologians of Paris on account of his partly free, partly mystical religious views, and was summoned before the Inquisition, which compelled him, after brief imprisonment, to recant, and adjudged his work "*De adventu Antichristi*" to be heretical. Under continual protest, boldly adhering to his religious opinions, which he defended in polemics, he sought to justify himself with Popes Boniface VIII., whose favour he succeeded in winning through medical services, and Benedict XI., but his rehabilitation was only brought about through Clement v., who received him with honour and showed him the greatest respect. Esteemed by his friends, hated and feared by his enemies, he played an influential part in the history of the religious movements and ecclesiastical policy of the late thirteenth and early fourteenth centuries. He was the adviser of crowned heads,

he filled the minds of the kings of Aragon and Sicily with his visionary religious ideas, the threatened knights templar and the distressed monks of Mount Athos turned to him for help, and through his exertions came into being an entirely new constitution for Sicily. According to trustworthy chronicles Arnold died on a voyage to the court of Clement v., upon the sea, in sight of the coast near Genoa. After his death he was accused of sorcery and of being in league with the Devil.

Arnold of Villanova was an extraordinarily prolific author. His writings, in barbarous Latin, but not wholly devoid of a certain elegance of expression, deal mostly with medicine, alchemy and astrology.

The life-story and labours of the famous Catalanian are partly bound up with the growing fame of Montpellier, and the figure of Arnold of Villanova incontestably survives as physician and alchemist in the memory of posterity, but his thought and action extend their influence not only over the domain of a particular school, but far beyond the confines of the art of medicine itself.

The nature of this remarkable man, who united in himself the physician with the alchemist, the religious enthusiast with the calculating politician, and whose many-sided pre-eminence was already appreciated by his contemporaries, may be taken as representative of late mediæval culture engaged in a struggle for fresh standards. His was an individuality confident in its own strength, filled with a yearning for universal knowledge, permeated with ardent religious longing, a full and complete nature which, with its lights and shades, can be comprehended, even in its purely medical aspects, only in relation to its life-theory as a whole, a life-theory which curiously interwove clearness of intellect with depth of feeling, lucidity of thought with imagination and mysticism.

The lines along which the genius of Arnold attempted reform were indeed diversified, but the many-sidedness of his intellectual activity sprang fundamentally from a single root, viz., from the aversion, reminiscent of Roger Bacon and awakened by wide experience of life, warm love of nature and inherent piety, against that one-sided intellectualism and barren, abstract formalism which pressed so heavily in the scholastic age upon the domains of science and belief.

In pleasing contrast with other medical literature of this period, Arnold's writings are no formal commentaries merging in abstractions, no dogmatically fixed interpretations of foreign views, but rather constitute a whole, permeated by the quickening spirit of investigation, in which the actual and the personal predominate. One becomes aware of the near presence of a powerful intellect, of a man with the courage of his opinions, who made due use of tradition without being overpowered by it, who succeeded in drawing for his knowledge, not upon lifeless book-learning alone, but also upon nature and life, who indeed never entirely overcame inherited

principles by means of epoch-making discoveries, but who knew how to master the heirlooms of past experience, to add to them and to cover the ground afresh from the standpoint of critical syncretism.

In the system of Arnold—for such may be spoken of—the chief medical tendencies are represented, Hippocratism and Galenism, the Salernitan school and Arabism, but the Catalonian follows none of these blindly. In the search for truth he trusts for the most part the guidance of his instinct, of his own observation, real or putative experience, he maintains especially a surprising independence in face of Arabic medicine; when occasion arises he does not quail in his polemics before the sacrosanct authority of a Galen or an Avicenna. Delving more deeply than his contemporaries into the original sources, he finds the courage in individual cases to express an independent opinion upon the value of antecedent evolution.

Rational empiricism with him held dialectics within bounds, and even although here and there he did not entirely succeed in withstanding the allurements of the latter towards theoretical subtleties, he nevertheless made use of it chiefly in order to clothe his thoughts and observations in the scientific garb of the period. If in comparison with rational empiricism dialectics are only of subordinate importance, this is even more true of a third intellectual phenomenon, superstition, which, whilst making itself felt in Arnold's general medical conceptions in the form of mystical natural philosophy (astrological and magical interrelationships between macro- and micro-cosmos), nevertheless does not attain to predominance therein.

The best insight into the capacity of this great physician is afforded by his "*Parabolæ medicationis*" and his wide-embracing compendium of medicine, the "*Breviarium*"; in comparison with these two masterpieces the remaining writings appear only as complementary in individual subjects and upon special questions.

In anatomy, physiology and general pathology Arnold has hardly anything to offer that could be considered a marked advance upon Galen and the Arabs, but, on the other hand, his pronounced instinct for truth, his brilliant gift of observation, are revealed in his specific pathological doctrines.

In place of the fine-spun, vague hypotheses which elsewhere constitute the bulk of mediæval compendia and which make their perusal so unprofitable, Arnold gives, first, a short definition of the complaint under consideration, then discusses minutely the predisposing and immediate causes as well as the pathological physiology, followed by an unusually careful and detailed description of the symptoms, having regard to considerations of diagnostic and prognostic importance; finally the method of treatment is dealt with.

His attempts at classification of disease, if incomplete, are often original, and at any rate praiseworthy.

The characteristic which chiefly distinguishes Arnold as a medical author and raises him high above the level of his contemporaries is the conviction that dialectics, barren and empty despite their deceptive glamour, can in no way satisfy either the spiritual needs or the real demands of science, that the subtlest reasoning cannot compensate for the lack of sensible experience,—a standpoint, therefore, in direct conflict with scholasticism. Through his extensive knowledge of the world and of men, through his wide learning, literary productivity and practical ability, he already stood out as a phenomenon.

Spirited opposition to an erroneous conception of science constituted, however, only one side of Arnold's meritorious labours, for with the same energy with which he opposed the abuse of dialectics in medicine did he combat the aimless therapeutic empiricism which became widely prevalent as the outcome of sceptical tendencies and self-satisfied mental inertia coupled with neglect of all theoretical principles.

Although credit is due to him for rejection of methodological errors, the Catalonian deserved yet more through his advance from negative criticism to positive performance. For, whilst all others despaired of escaping from the dilemma between scholastic dogmatism and crude empiricism, he demonstrated that the road was open to a rational art of healing, one, namely, which united the ratio with the experimentum, which was built upon the constant interrelationship between theory and practice, and the guiding principles of which were not borrowed unquestioned from foreign sources, but were the outcome of critically considered experience. And, opposing those who ventured to cast doubts upon the scientific character of medical art as a whole, he sought to establish proof of the fact that medicine, even in its empiricism, was based upon principles of reason, that the general foundations of medical action have emerged from the natural instinct of mankind for truth.

With the rational basis of the art of healing thus aimed at by him, Arnold unites also a high moral conception of the medical calling and genuine humanity inspired by true piety and deep responsibility.

The contest waged by Arnold of Villanova against two foes, uncritical empiricism and scholasticism, is reflected in some of his writings. Thus he says in the treatise "*De considerationibus operis medicinæ*", that the empirics contented themselves with confused accumulation of "*Particularities*", which in themselves were derived from second-hand sources, and he also protests energetically against those who would deny the influence of rationalism on medicine. In the treatise "*De diversis intentionibus medicorum*" he blames, on the other hand, the neglect of experience. A systematic exposition of the principles of

practical medicine is found in the Hippocratically inspired "*Parabolae medicationis secundum instinctum veritatis aeternae*", certainly one of the most important works of the entire Middle Ages, which seeks to demonstrate the mutual interaction of theory and practice. Arnold's highly moral and deeply religious conception of the medical career finds expression in the treatise "*De conservanda sanitatis*". The faulty education, one-sidedness or frivolity of many of his medical contemporaries afford Arnold frequent opportunities, even more than do the dealings of charlatans and quacks, for blame or complaint. Many passages in undoubtedly genuine writings, however, bear witness to the fact that he himself did not always remain wholly free from a certain mysteriousness and leaning towards self-advertisement.

Arnold's supereminence is best shown in his therapeutics, as these give due weight to the imperishable principles of Hippocratism through strict individualisation, careful consideration of the general constitutional condition, and preference for dietetic and expectant treatment.

Arnold, who devoted the greatest attention to diet and hygiene as prophylactic measures against disease, who laid down in his works a number of admirable precepts concerning regulation of the mode of life, also laid special stress upon dietetic measures (food, baths, physical agencies, etc.) in disease (particularly in young persons and in chronic complaints). Special mention should be made of his extensive dietetic and therapeutic use of wine in cases of illness, to which he devotes an entire treatise. In the prescription of medicaments he paid careful attention to the age, temperament, habits of life, etc., of the patient; so long as the diagnosis was in doubt, also in the stage of crisis and at the height of the disease he made use only of mild indifferent measures. He made choice and use of medicines dependent upon precisely laid down indications and expended the minutest care upon the preparation of medicaments. In most meritorious fashion he combated the irresponsible employment of substances not sufficiently tested, such as narcotics, etc. His *materia medica* consisted mainly of vegetable, but also of animal and mineral substances; his subtle therapy was based upon known fictitious postulates of qualities, complexions and grades of medicines, but a novelty in this connection consists in the assumption of a "specific property" inherent in drugs. As a therapist Arnold derived great advantage from his considerable chemical knowledge (distillation of alcohol from red wine, volatile oils, aromatic waters, metallic preparations).¹ He is undoubtedly to be looked upon as one of the fathers of medical chemistry. In addition to diet and medicamentation, blood-letting (leeches, cupping, venesection) played no small part in his methods of treatment.

He undoubtedly took an interest in surgical matters, but it would appear that he did not actively practise it, although he is quoted as a surgical author by his successors. The

¹ Later researches prove that the discovery of alcohol, of essence of turpentine, of sulphuric and other acids is not to be ascribed to Arnold, but nevertheless the introduction of alcohol into medicine remains to his credit.

"Parabolae medicationis" contains general maxims and the "Breviarium" deals specially with surgical diseases and their treatment. Arnold indeed mentions there the most important operations, but holds aloof from lithotomy, herniotomy and extirpation of goitre. The "Breviarium" contains much that is of interest in relation to gynaecology and obstetrics—for the first time in literature amongst normal presentations is included that by the feet, mention also being made of cephalic or podalic version.

It is indicative of profound insight that he should in his treatment of the sick have ascribed a particular and far-reaching importance to the psychic factor; doubtless he himself owed many of his successful results in practice to this very consideration. Thus he says: "It is of the utmost importance to the physician to be able rightly to make use of the sufferings of mankind, to win men's confidence and know how to stimulate their imagination; there will then be little that he may not accomplish".

It would nevertheless be a mistake to look upon the Catalonian as a whole-hearted representative of rationalism (in the modern sense), for in Arnold's medical thought ample place is found for the hazy ideas of a mystical conception of Nature, and one is constantly reminded that as physician he put faith, though not unconditionally, in astrology and other secret sciences and was an industrious alchemist.¹ Many passages in his works prove how contradictory thoughts jostled one another in his brain, and how little Arnold succeeded in attaining complete enlightenment. The same man who drew such accurate clinical pictures, who opposed the supernatural origin of certain affections, *e.g.* sterility, admitted the frequent origin of mental disorders through witchcraft and incantation, made use of amulets for therapeutic purposes, looked upon gold as a panacea, made prognosis and treatment subordinate to observation of the constellations, believed in dream-ports, and reports how he himself had caused warts to disappear by means of charms.

All these discrepancies, however, are not wholly lacking in a connecting link of logic. What may appear to us from the point of view of modern

¹ As an alchemist Arnold has earned a lasting reputation; nearly all the later devotees of the Spagiric art acclaim him as master; a number of alchemistic writings, many of them doubtless apocryphal, pass under his name. Examination of these discloses that he derived inspiration from the earlier literature and laboured with honest conviction, although there were not lacking the boastings found in all writings of this kind. The saying is ascribed to Arnold that he would turn the sea into gold by means of his elixir if it consisted of quicksilver. With posterity even more than with his contemporaries he enjoyed the reputation of a sorcerer whom the Devil had endowed with the power of transmutation of metals. He took mercury and sulphur as *principalia naturalia*, *i.e.* the principle of the immutable and that of the mutable, the changeable. The differences between metals consisted in the greater or less admixture of the sulphurous principle, the possibility of transmutation upon the common origin of metals. Arnold's very complex procedure consisted chiefly in repeated distillation or sublimation of quicksilver and amalgams of copper, gold and silver with addition of vinegar and salt, trituration, filtration, certain oxidation processes over the fire and separation of impurities. The favourite comparisons of alchemistic processes with organic phenomena, of procreation, birth, growth, etc., are noteworthy.

conceptions to stand in irreconcilable opposition—natural against reputedly magical phenomena—were not for Arnold separated from one another by any unbridgeable gulf, whilst the doctrine of the interrelationship between the planetary world and the world of elements, of the correspondence between macro- and micro-cosmos, was the point around which his fundamental principles were centred. In the twilight of astrology, which was indeed considered an exact science, the occult idea of astral influence only too readily passed as a law of Nature in which the key was to be sought explaining those real or supposed facts which surpassed the restricted knowledge of the schools. It is proof of a critical gift rare in that epoch, that Arnold, who denied no facts *a priori* upon purely rationalistic grounds, should at least have attempted to restrict the domain of supernaturalism.

Arnold of Villanova belonged to an age in which blind belief in authority prevailed, in which intellectual freedom found almost its only refuge in mysticism, and in which technical investigation was practised only by the very few. That he as physician should have made of the last a pivot around which his activity centred, and with the entire weight of his personality should have entered the lists against scholasticism, that he should have known how to draw from the well-spring of antiquity and so to cultivate the soil of Arabism as to obtain good fruit, are achievements which assure him a prominent place in the history of medicine.

The high esteem in which the Catalonian is to be held, despite many deviations from the right path, is shown by a comparison with the famous and influential teacher of the school of Montpellier at the close of the thirteenth century, Bernard de Gordon, but even more if a parallel be instituted between Arnold and his intellectual affinity, Pietro d' Abano, the latter of whom established the fame of the Paduan school at the beginning of the following century.

Bernardus de Gordonio (Bernard de Gordon), one of the most famous physicians of the Middle Ages, came presumably from one of the various places in France which bear the name Gourdon (or possibly from Scotland), and taught in Montpellier from 1285 onwards. He began in 1305 his long-esteemed magnum opus "*Lilium medicine*". In a preface he explains thus the title of the book, which is divided into seven "*Particulæ*": "*In lilio enim sunt multi flores et in quolibet flore sunt septem grana quasi aurea*". The work is a faithful reflection of the subtle scholasticism, the polypharmacy and the superstition of the age, and from its contents represents only a perpetuation of Arabic views, but is characterised by brevity and lucidity.

Pietro d' Abano—Petrus Aponensis—was born in 1250, the son of a notary in the village of Abano, near Padua, celebrated for its sulphur springs. Little is known of his course of study beyond the unusual fact that, through a long residence in Constantinople, he acquired a knowledge of Greek. He completed his studies in Paris, becoming later a teacher of philosophy there, with a success that earned for him the honourable title of "*le grand Lombard*". In 1306 he commenced his teaching career in Padua. Pietro d' Abano, who surpassed most of his contemporaries by his astonishing erudition and penetrating

sagacity, was looked upon by them as a marvel. Whilst his fame spread afar, he gave a handle to his enemies by his vigorous defence of astrology and still more so by his adherence to Averroism, which was banned by the Church, and he was accused by them of magic and heresy. Luckily the great physician was saved from martyrdom by the powerful protection of the town of Padua and the goodwill of the Popes. Pietro d' Abano, who had in 1314 received the flattering invitation to undertake the professorship of medicine and physics at the newly-founded school of Treviso, died a year later. The Inquisition adjudged him guilty of heresy after his death and, according to one account, sentence was carried out upon his exhumed body. Grateful Padua, however, erected a century later a memorial to its great citizen.

Pietro d' Abano (1250-1315)—*Petrus Aponensis*—resembles Arnold of Villanova in many respects, and like the latter learnt by experience with what a watchful eye the Inquisition marked the first stirrings of intellectual freedom. The Lombard, like the Catalanian, was a bold thinker, an acute critic, a scientist inspired with a universal thirst for knowledge, with a strong leaning towards the secret arts (particularly towards astrology); like Arnold, Pietro d' Abano also outshone his professional contemporaries by his wide technical knowledge, mostly derived from Arabic literature, by his comprehensive scientific attainments, by his linguistic culture. Both, too, dissatisfied with things as they found them, strove to raise medicine from a condition of chaotic division to a uniform, harmonious whole. The method, however, in which each commenced erecting an edifice of scientific medicine, the totally different position taken up by each as a medical investigator, teacher and author in opposition to scholasticism, divide them irreconcilably from one another—they became real antagonists.

Thus, whilst Arnold of Villanova as far as possible gave pride of place to experience, if often uncritical and dimmed by prejudice, Pietro d' Abano, relying implicitly upon the sovereign power of philosophic speculation, thought it possible to reconcile the antagonism in scientific and medical views, to solve theoretical and practical problems simply by means of critical comparison of authoritative doctrines, by the most subtle analysis of ideas and formal syllogistic reasoning, superior to all objections. As Arnold, where he builds upon Arabic foundations, appears as the disciple of Rhazes and Ali Abbas and Avenzoar, so does Pietro d' Abano represent in the West the teaching of Avicenna and Averroes, to the latter of whom he accords the highest honour as a philosopher. It might indeed be said that Pietro d' Abano, in conjunction with Taddeo Alderotti, was the model for all later medical dialecticians, although he surpassed the latter in breadth of outlook, in scope and depth of knowledge, in subtlety and coherence of method.

What the abstract thought of the age succeeded in achieving in the domain of medical science, is as it were concentrated in the great work of this master of medical scholasticism, permeated by Averroistic Aristotelianism,

in his "*Conciliator controversiarum, quae inter philosophos et medicos versantur*", which for centuries was held in high esteem and after which he was himself known as "*Conciliator*".

The "*Conciliator*" discusses under the heading of natural philosophy the most diverse problems of theoretical and practical medicine as well as hygiene. Each of the questions raised (*quaesita*) is answered in the true scholastic manner, with a subtlety reminiscent of ancient and Arabic dialectics, a considerable portion of the exposition being composed of a refutation of opposing solutions (*opposita*), often associated with keenly critical analysis. Amongst the problems there is included along with the rational no little that is fantastic—problems that sprang from an exaggerated subtlety—and the solutions offered are almost wholly devoid of any permanent value, since in the arguments adduced empirical matters of fact are largely and decisively outnumbered by cunning syllogisms containing little truth.¹ On the other hand, the interesting fact must not be lost sight of that the author in many of his conclusions, particularly in dealing with natural science, is in advance of his age and comes within measurable distance of our knowledge.²

It is hardly surprising that the "*Conciliator*", by means of its juggling with Aristotelian categories, should have left the impression upon its epoch of an example of sublimest learning, and through its apparently irrefutable solutions of problems should have lulled generations to come with a belief in their possession of certain knowledge. The contemplation of such errors only arouses in us the comforting reflection that the exaggerated contradiction of authorities and the strained interpretations of their doctrines—in themselves signs of awakening criticism—were bound to lead to some doubt concerning the reliability of the prevailing methods of proof.

A comprehensive view of the most eminent men and of the literature shows us that the scientific medicine of this era was mainly, if not exclusively, associated with Italy, and that the medical art of the entire West derived its impulses, directly or indirectly, from her alone. Italy also led the way in organising the medical profession, in creating the apothecary's calling, and in many official measures tending to improved hygiene.

¹ Thus, *e.g.*, an attempt is made to answer the question whether the nerves originate in the brain or heart by the artifices of dialectics. The question whether fever-patients should be given barley-water is decided in the negative, after all manner of subtleties, on the ground that barley-water is a substance, but fever, on the contrary, an "*accidens*".

² Pietro d'Abano ascribed weight to air, explained the rainbow by diffraction of light rays, taught that the equator was inhabitable, and calculated with approximate accuracy the solar year and the time of entry of the sun under the influence of the various signs of the Zodiac. As regards physiology he defended the view that the veins spring from the heart and not from the liver, that respiration is essentially a voluntary act.

The impulse which in Italy was given to the profession of medicine and to authoritative sanitary control was founded upon the comparatively high degree of urban civilisation existing there and was reinforced by the events following as a sequel upon the crusades (transit of sick and wounded in immense numbers, pestilence), by active intercourse with the East, by the immigration of foreign physicians (Saracenic, Jewish). On every hand hospices, hospitals, lazarettos sprang into being. The physicians outside the university towns united into colleges which with their growing membership instituted an examination system, *e.g.* in Milan, Brescia, Florence. The scientifically educated surgeons were distinguished from the physicians, but in addition to the former a heterogeneous class of empirics carried on a more or less surgical practice (*chirurgi phlebotomatores, barbitonsores, bone-setters, dentists and eye-doctors*). Arrangements were early made for the appointment of municipal medical officers, who treated the poor gratuitously and acted as officers of health (supervision of hospitals, combating epidemics), as medico-legal experts, finally also as army surgeons.

The medical conditions obtaining outside Italy will be referred to in a later connection; in so far as the scanty information permits of it, it may here be pointed out that all countries of Christendom, however far the majority of them may have lagged behind in the evolution of medical science, at least displayed a noble and most praiseworthy emulation in the care of the sick, in the erection of hospitals, leper-houses and infirmaries, and that activity in this field of humanity reached a height in the thirteenth century which deserves recognition even from the latest generations.

Filled with deep religious feeling, not only members of clerical, monastic and nursing orders, but the laity also, even in the most exalted circles, devoted themselves to care of the sick, as instances of which may be given St. Elizabeth of Thüringen and St. Hedwig. St. Louis, who showered gifts upon the Hôtel Dieu and founded similar institutions in Fontainebleau, Pontoise, Vernon, as well as the still existing institute for the blind, the Quinzevingt in Paris, himself dressed the wounds of lepers and compelled the surgeons, to whom he extended privileges, to devote themselves to the care of the poor.

On every hand hospitals and leper-houses came into being. The foundation of hospitals is less connected with branch foundations of the knightly brotherhoods than with numerous daughter institutions, scattered over the whole of western Europe, taking their origin from the hospital San Spirito in Rome—the hospitals of the Holy Ghost. These owe their origin to the powerful initiative of Pope Innocent III., but were not exclusively foundations of the Holy Ghost, but partly institutions under municipal control with similar arrangements and aims.

MEDICINE IN THE LATER MIDDLE AGES

Vestigia terrent.

SCIENTIFIC medicine in the later Middle Ages is the outcome of that method of study which in the course of the thirteenth century was initiated and developed by individual eminent medical investigators in close association with scholasticism.

As the chief outcome of this method was the presentation in homogeneous form of Galeno-Arabic tradition by means of the artifices of Aristotelian dialectics, it is not surprising that the results attained do not indicate any really epoch-making progress either for theoretical knowledge or for medical practice. The impressions left by a study of the comprehensive but not yet wholly accessible literature of this age unite to form a picture which amounts to little more than a reproduction, distorted and often grotesque, of the Arabic original in the garb of scholasticism.

Medical scholasticism and Arabism (with their sequelæ of astrology and uroscopy) were carried to extreme lengths and dominated and cramped both investigation and doctrine. No author was able completely to emancipate himself from their influence, although all were not to the same extent subject to the incubus and the glamour of dialectics. There were not a few who could upon occasion include within the rigid bounds of a doctrine independently acquired medical experience, although, buried in a wilderness of quotations and logical subtleties, this seldom met with deserved consideration or generalised application. The objections which here and there were timidly raised against traditional doctrines dealt almost solely with minor questions or practical details; they were not intended to assail the supremacy of the system or method and were indeed little adapted to that end. Not until the second half of the fifteenth century did a change make a tentative appearance, ushering in a new era of civilisation the hall-mark of which was the negation of mediæval ideals.

Surgery, although by no means untrammelled by scholasticism, was far less hampered by it, through its nature, in spite of adherence to general pathological doctrines, never having been able to the same degree to dispense with observation and experience as had internal medicine in the bondage of

dialectics. Slowly but steadily surgery made progress in several directions, the sum of which undeniably constitutes a gradual victory by means of technical dexterity over the traditional Arabic horror of the knife.

Although great new ideas and revolutionary practical attainments are lacking, this epoch of most unbending medical conservatism presents at least one bright spot—dissection of human bodies, neglected throughout 1500 years, was once more practised after the fourteenth century.

This momentous event alone is sufficient to imbue the medicine of the pre-Renaissance with some interest, even although its endeavours, for the most part, possess no greater value than that attaching to instructive errors.

The rigid conservatism of medicine in the pre-Renaissance era is the more surprising since, in most of the other branches of knowledge, in addition to adherence to ancient tradition, there can be recognised an eager striving after fresh ideals which heralds the approach of an evolution upon entirely different lines.

Viewing the changes in ecclesiastical, religious, political, social and economic life,¹ and the increase in the knowledge of arts and crafts, the technical progress,² two main phenomena of intellectual life in particular mark the breach with the one-sided mediæval clerical ideals,³ the disintegration of scholasticism and awakening humanism.

The reconciliation effected in the thirteenth century, by the aid of peripatetics and by a rare organising faculty, between philosophy and ecclesiastical doctrine, between science and belief, began to dissolve and disappear under the influence of Duns Scotus and, following the domination of nominalism as founded by Occam, in order to make way for the conception of a divided truth, of the existence of two strongly differentiated domains, those of the transcendental and the natural. Simultaneously through the influence of the revived study of antiquity and a growing appreciation of nature, the fetters were loosened in which culture and art as a whole had languished. The fact that medicine was in a state of stagnation and clung with peculiar obstinacy to all those traits which were characteristic of real mediævalism, finds its most lofty expression through Francesco Petrarca, the protagonist of humanism and the Renaissance, the apostle of the wakening national consciousness and of the secularisation of culture.

To him who first sounded the unplumbed depths of subjective experience and sensation, of reflective understanding of nature, who purposely paved the way for scepticism and criticism, the whole mode of thought of contemporary medicine was of necessity the object of mistrust, of a largely justified aversion and of embittered attack—although subordinate personal considerations may have played a certain part therein. How greatly Petrarch, who unsparingly lashed other evils of the day, concerned himself with the conditions of medicine and the behaviour of the profession, appears from many of his works, particularly in "*De vera sapientia*", "*Epistolæ de rebus senilibus*", "*Epistolæ sine titulo*", "*De sui ipsius et*

¹ Decay in Papal political power, exile in Avignon, schisms, councils—degeneracy of the clergy, heretical communities, pre-Reformation religious movements (Lollards, Wickliffites, Hussites), mysticism—waning of imperial power and of the feudal system, growth of nationalism, of cities (Italian civic states), rise of citizenship, peasant revolts—replacement of barter by money currency, etc.

² Contradiction of the doctrine that earth and water are two excentric masses, knowledge of the periodic variations in position of water and land, Pierre d'Ailly's "*Picture of the World*", topographies, maps, books of travel—spectacles, paper, gunpowder, firearms, clocks, watches, improvements in the compass, etc.

³ These had found in Dante's "*Divina Commedia*" their last and loftiest expression, but with an accompanying lament upon the conditions of the times, which were in reality so entirely different.

aliorum ignorantia", "*Invectivae contra medicum quemdam*". The following is an epitome of his attacks, in so far as they deal with contemporary conditions and have been justified by the course of history—on the other hand, Petrarch's polemic against the art of medicine in general, reminiscent of Cato and Pliny, must remain undiscussed on account of its complete failure to recognise the nature of the scientific life and the high, far-reaching nature of medicine.¹

First and foremost the great humanist opposes and derides the search on the part of medicine for a philosophic foundation. Apart from the fact that in his opinion it was quite incapable of attaining this, and, with aims quite different from those of philosophy, required very different methods, Aristotelianism, wholly discredited and resting upon no basis of fact, was not in the least suited to this end. If philosophy had been led astray by misuse of dialectics—confusing the means with the end—so would the art of disputation react with special harmfulness upon medical science, because it had the effect of diverting attention from observation and timely action. Formerly the sick had been healed without overmuch reasoning, now they were offered syllogisms, but the promised help was withheld. "*Quid est opus verbis? Cura, semper dixi, medice.*" It is ludicrous, too, that physicians should lay so much stress upon rhetoric, which is nothing to the point, converts the art of medicine into empty verbiage and serves at best to conceal the inadequacy of knowledge beneath vague prevarications. Petrarch further inveighed against the belief of the physicians in authority. With all respect due to the great masters of antiquity, neither to Hippocrates nor even less to Galen can be ascribed absolute authority, since their art is not based upon a sure foundation; a mere reference to their doctrines should not be considered final if personal observation and independent judgement point to an opposite conclusion. The voice of Nature should be listened to, not that of Hippocrates, and it should be obeyed, not because Galen may direct it, but because an inward monition counsels it. The blind faith in authority on the part of the physicians was based, moreover, only upon ambiguous interpretation of the ancients, whilst the sole community between Greek and contemporary medicine consisted in a terminology of Hellenic origin. The worst influence, however, was that of Arabism, which indeed brought disgrace upon the times and robbed medicine in particular of its ancient fame. In close association with this stand the errors of astrology, alchemy and magic, of uroscopy and coproscopy, which Petrarch collectively rejects as partaking of charlatany and superstitions. Dietetics, exaggeratedly, even tyrannically impressed upon patients, but little regarded by doctors themselves, fell into disrepute through internal contradictions, and lacked any really reliable foundations; therapeutics, whilst surrounded by a halo of science, was in fact no more than a conglomeration of indiscriminating credulity and conscious deception; in practice, which is mostly the sport of chance, the physicians take credit indeed for every happy issue whilst ascribing unfavourable results to every possible cause but the real one—their ignorance. From the above it is not surprising that Petrarch should judge harshly of contemporary medicine and express the opinion that the energies of most of its representatives are directed towards deceit. The misdeeds of surgery, on the other hand, were more leniently considered.

However much Arabic scholastic medicine may have fallen short of the standard already attained by certain eclectic thinkers in the pursuit of science, an impartial historical review cannot leave out of consideration certain mitigating circumstances. Foremost amongst these is the fact that the intellectual transformations which were noticeable in the pre-Renaissance era only reached finality at a much later date, and that contemporary

¹ He accorded no high place to medicine amongst the arts and sciences because it cared only for the body without regard for the soul, indeed he looked upon it only as a trade, denying it all credit for striving after a real scientific foundation.

medicine was influenced, not by doctrines in the making, but by those which already triumphantly held the field. It is also a matter of no little moment whether for a critical judgement choice is made of the evolution of medicine as a whole or of the gradual development of medical knowledge amongst Western nations. What in the first instance may be regarded as absolute stagnation, if not in the second losing the character of error, at least appears in a more favourable light if the range of literary knowledge, the level of theoretical reflection, and even the practical knowledge of the Arabic scholastic era are contrasted with the attainments of Oriental medicine in the early Middle Ages.

Bologna, Padua, Montpellier and Paris entered into the inheritance of the medical treasure of the thirteenth century; they constituted a centre of scientific activity and dominated by their far-reaching influence the remaining schools, the number of which began to increase to no slight extent, although the whilom greatness of Salerno remained but a memory. The foundations laid by Taddeo Alderotti, Pietro d'Abano, Bernard de Gordon were industriously built upon by succeeding generations of disciples, whilst the endeavours towards reform of Arnold of Villanova remained neglected and by no means earned the fame that the interests of progress demanded.

The medical literature of the fourteenth century is a sufficiently evident reflection of its chosen models. It is essentially receptive, consisting exclusively of compilations and commentaries, the dogmatic foundations for which are to be found in the doctrines of the Arabs, of Galen and of Aristotle. The impulse to eclipse these was entirely lacking, nor was the capacity forthcoming, the end and aim of authors being confined to making excerpts from the inherited sum of knowledge, in interpreting it, in eliminating contradictions and reducing it to convenient, readily accessible and compendious form. The literary productions, which arose partly to supply the demands of Arabic and scholastic investigation and education, partly to satisfy the needs of practitioners, can be divided into certain main groups, the most important of which (apart from specialised works) are the following: medical glossaries, collections of aphorisms, commentaries (expositiones), text- and hand-books (*Practica*, *Breviarium*, *Lilium*, etc.—introductory epistles, *Introductorium*, *Clarificatorium*, etc., casuistic treatises (*consilia*)).

Glossaries (explanations of technical terms, medical dictionaries) were the more necessary since the terminology in Latin translations of Arabic works was, on account of many perversions and mutilations, frequently obscure; they usually deal only with the names of remedies. To the compilations in the widest sense belong the *Concordanciae*, which under special headings briefly reproduce appropriate sayings from the authorities; also such works as either collect only the most important extracts from the fountain-head—*Aggregator*, *Summa*—or seek by means of criticism and the dialectic method to reconcile the contradictions of authorities—*Conciliator*.

The very voluminous literature of the fourteenth-century physicians constitutes a memorial of untiring zeal and astounding erudition, but it also affords an example of and a warning against an entirely discredited method. Reading and belief in authority occupy the position which should be filled by clinical observation; endless syllogisms usurp the place of experience; subtle definitions, vague scholastic, purely abstract, discussions of problems in physiology, pathology and therapeutics stood in those days for scientific investigation. And if in the barren wilderness of quaestiones and propositiones, of incredibly subtle and interminably diffuse argumentationes, recollectiones, quodlibetationes, etc., there appears an oasis of observation, the already inadequate clinical description is promptly overwhelmed by a mass of eager speculation born of Aristotelianism or a heterogeneous assemblage of formulæ.

Since the authors drew their inspiration, not from the well-spring of life, but from ancient book-lore common to all, and in their manipulation of tradition the same mental processes were traceable, there obtains in the literature a wearisome uniformity, a depressing aridity—at least as regards the chief contents; it would indeed be hardly too great an exaggeration to say that, when one has read one or other of the writings, one has read all. The value of these early achievements in the eyes of posterity is expressed in the fact that only a modest fraction of the voluminous literature has found its way into print.

Although it may be a task for bibliographers and historians of literature to drag to the light of day the many manuscripts reposing in the dust of archives, to catalogue them and by means of new editions to rescue them from oblivion—pragmatic history has amply satisfied the claims of intellectual continuity by only making mention of the most prominent representatives of medical scholasticism, particularly of those whose fame outlived the epoch, whose works long played a part in medical education.

The most gifted interpreters of ancient and Arabic writings, the most subtle dialecticians came from Northern Italy, where juristic formalism, then at its zenith, and carefully nurtured peripateticism in its Arabic garb exercised a specially favourable influence upon the development of commentary activity.

From the school of Bologna emanated Guglielmo Corvi of Canneto near Brescia, whose *Practica*—the *Aggregator Brixiensis*—served as a model for a whole series of scholastically elaborated compilations; the commentator Torrigiano di Torrigiani, whose elucidation of Galen's *Ars Parva*, "*Commentum in librum Galieni qui microtechni intitulatur*", was long utilised as a text-book; the scions of the medical family of Varignana, of whom

Bartolommeo and Guglielmo Varignana in particular became noted as teachers and authors; further, Dino del Garbo, who on account of his highly esteemed interpretations (particularly of Avicenna) received the honourable title of "Expositor", and his son Tommaso del Garbo, the latter of whom furnished a lively picture of contemporary medicine in his "Summa medicinae", arranged as "Quaestiones".

With the famous masters of Bologna entered into competition those of Padua, where the tradition of Pietro d' Abano and therewith of Averroism remained a constant influence. Mention must here be made in the first place of Gentile da Foligno, and that not alone on account of his famous Commentaries (upon Galen's *Ars Parva*, upon the didactic poems of Aegidius Corboliensis, etc.), but mainly on account of his *Consilia*, a case-record which betrays an impulse towards original clinical observation, if trammelled by dialectics and a belief in drugs. The fame of the Paduan school was in addition upheld by the members of the medical family of St. Sophia—notably Marsilio and Galeazzo de St. Sophia—also by the author of the "Aggregator Paduanus" (a compilation dealing with remedies), Giacomo de' Dondi, and his son, Giovanni de' Dondi, who succeeded in maintaining a remarkable independence of judgement in face of the prevailing doctrinairism, and who also earned the highest reputation as a practitioner.

Giacomo della Torre, of Forlì (Jacobus Foroliviensis) taught first in Bologna, later in Padua, and was one of the most celebrated of the commentators, whose interpretations of the Hippocratic aphorisms, of the *Ars Parva* and of individual portions of Avicenna's Canon enjoyed a lasting esteem.

As regards the literature which emanated from other Italian centres of learning, two works in particular deserve mention as of importance towards a knowledge of mediæval medicine: the *Supplementum Mesuë* of the Neapolitan body-physician, Francesco di Piedmonte, a compendium drawing inspiration from the Salernitans and dealing with a great part of special pathology and therapeutics (also obstetrics); and the *Sermones medicinales* of the Florentine Nicolo Falcucci (Nicolaus Florentinus), an immense encyclopædia of the whole of medicine, derived mostly from the Arabs and reviewing all the knowledge available up to the end of the fourteenth century.

The fact must be recognised that this expenditure of intellectual energy was not wholly purposeless, that the keen-witted commentaries and industrious compilations assisted, or indeed replaced,¹ the study of the monu-

¹ One must also not forget the great cost of laboriously transcribed copies of the original works, so that even the faculties had only slender libraries at their disposal.

mental Galenic and Arabic works, but herein lay their sole—temporary—value, for, given up to idolatry of the sacrosanct authorities, they contained little or nothing of individual critical experience. Faint traces of independent observation are almost alone to be found in the collections of Concilia and even more in the pharmacologico-botanical and balneological literature. Especially favourable examples on these lines are the “*Pandectae medicinae*” (an alphabetically arranged *materia medica*) of the Mantuan physician Matthaëus Sylvaticus, afterwards resident in Salerno, who outdid Simon Januensis, and the balneological works of Giovanni and Giacomo de’ Dondi.

The attempt has been made to establish a distinction between the school of Bologna and that of Padua, the former being considered representative of Greek, the latter of Arabic scholasticism. This applies at most to the commencement of their development and only to individual authors who devoted their interpretative art either chiefly to the service of Galenic and Hippocratic writings, or to Avicenna, Averroes, etc. Apart from the fact that such a differentiation is of little real significance, since the universally employed scholastic method was the real determining factor, the distinction in the prime of Arabism cannot strictly be drawn.

The statement may confidently be made that Montpellier, despite the domination of scholasticism, never entirely lost sight of empiricism, and by preference of Rhazes over Avicenna stands for a less exaggerated degree of Arabism. Much of the literature of this school, indeed, lies hidden in obscurity, but the material at our disposal at the present day suffices to arouse a more favourable impression when contrasted with the output of the North Italian universities.¹ The best-known alumni are Gerardus de Solo, who distinguished himself as a commentator of Rhazes and was the author of a long popular text-book for students, “*Introductorium juvenum*”, and Johannes de Tornamira, of whose writings the widest recognition was attained by the eminently practical school compendium (founded upon Rhazes) “*Clarificatorium*”. Through these two men Montpellier wrought a profound and enduring impression upon mediæval medical education, particularly upon instruction in the elementary technical subjects. Another ornament of the school was Johannes Jacobus. The predilection for the practical, the assiduous attention to therapeutics which particularly characterises the physicians and teachers of Montpellier unfortunately led many of them into an uncritical empiricism, often permeated with a wild superstition, as is exemplified by Gilbert and Bernard de Gordon.

To a still greater degree does this hold true of an imitator of both in

¹ Doubtless the proximity of the Papal Court at Avignon, to which the most eminent practitioners were attracted as court-physicians, exercised a favourable influence.

Oxford, the Englishman John Gaddesden, whose compendium "*Rosa Anglica*" in places surpasses everything that medical mysticism had called forth even in this age. Somewhat soberer is the "*Breviarium*" of another representative of this school, John Mirfield, who also bequeathed a *materia medica* in lexicon form (*Synonymi Bartholomaei*).

We have very scant knowledge concerning the literary output of the medical school of Paris, where the writings of Aegidius Corboliensis and John de St. Amando were still held in high esteem and long exercised a restraining influence upon Arabism. That clinical observation was not wholly neglected despite a leaning towards scholastic speculation is proved, for example, by the recently discovered records left by a young German physician studying in Paris at the end of the fourteenth century, dealing with the practice and teaching of certain learned practitioners.

It is probably to be ascribed to the influence of the two French schools that the earliest representatives of scholastic medicine from the German Empire stand for a soberer, more practical tendency, which asserts itself in a preference for dietetics, and in an opposition to the degeneracies of alchemy, uroscopy, etc. The writings of Thomas of Breslau, Bishop of Sarepta, and of the first teacher of the oldest German academy—Prague—Magister Gallus, of Salko von Hosstka, and particularly of Sigismundus Albicus (a gifted disciple of Arnold of Villanova), afford brilliant examples of this.

The terrible epidemics of plague in the fourteenth century afforded mournful opportunities for the production of a special variety of prophylactic-dietetic treatise, particularly "*The Great Death*" and "*The Black Death*" (at its height in 1348), which by its fearful devastations and injurious consequences to civilisation stands alone even in the history of plagues. The plague writings of this and the following centuries vary little one from another in their prevailingly hygienic and dietetic recommendations.

Concerning the history of the plague pandemic of the fourteenth century reference must be made to the literature on the subject, particularly to the recent exhaustive work by G. Sticker. It may only be mentioned that the sum total of lives sacrificed to the Black Death in Europe has been estimated to reach 25 millions.

The medical faculty of Paris issued in 1348 an edict upon the Plague, its course, avoidance and cure, "*Compendium de Epidemica per Collegium facultatis medicorum Parisiis ordinatum.*" In regard to prophylaxis and dietetics it is therein laid down: "That incense and camomile should be burnt in large quantities in public places, in much-frequented spots and in the interiors of houses . . . no poultry should be eaten, no water-birds, no sucking-pigs, and especially, no fat meat. We recommend broths with powdered pepper, cinnamon and spices to those who habitually eat little and daintily. Sleep should not be prolonged beyond dawn or a little after. Little should be drunk with breakfast, the mid-day meal should be taken at eleven; with it a little more may be drunk than with breakfast, preferably a light wine, mixed with a sixth part of water. Dried and fresh fruits are harmless if taken with wine; without it they may become dangerous. Going out at night until three o'clock in the morning

is dangerous, on account of the dew. Fish should not be eaten ; overmuch movement may be harmful ; clothing should be warm, cold should be avoided, as well as damp and rain ; cooking should not be done with rain-water. Fat people should avoid the sun. Diarrhœa is a suspicious symptom, baths are dangerous, enemata should be employed to keep the bowels open. Association with women is fatal ; one should not marry nor sleep in a bed with one."

In the year 1349 a similar edict emanated from Montpellier.

The behaviour of the physician in visiting plague patients is discussed in a document dating from the end of the fourteenth or beginning of the fifteenth century, which contains the following recommendations : " See that the urine-vessel is covered with a three- or four-fold linen cloth so that the emanation do not arise from the urine. 2. Discover if the house of the patient have ample ventilation, if not bring the urine-glass into the street and examine it there. If, on the other hand, it have a broad courtyard and ample access of air, then can the urine be safely examined even in the centre of the house. 3. It is preferable that the urine-glass should be held by the people outside the patient's house, than that thou should'st hold it in the hand. If thou art obliged, however, to take it in the hand, do so only with gloves and put it quickly away. 4. The excreta should be examined only from a distance in the open air and hastily. 5. When thou comest to the patient's chamber beware of entering it if it be narrow, small and badly ventilated, in such case cause the patient to be carried out and direct that he be held higher than thyself ¹ if possible ; thou canst then feel his pulse, but never his bed-clothes and what is wrapped round him. If the room is wide, spacious and well-ventilated, thou may'st boldly enter, particularly if door and window be wide open to the fresh air. Then feel the pulse as directed. 6. It is advisable only to grasp one arm, namely, the one which is the more easily reached. 7. Give directions that door and window of the sick-room be kept open at least from sun-rise to sun-set. Should this be distasteful to the patient direct that it be done at least for some time before thou enterest, otherwise go not in. 8. It is advisable that all that comes from the body of the patient, such as stools, urine and expectoration, should be as completely as possible collected, carried out of the sick-room and kept in a convenient, distant spot. 9. It is advisable that all clothes and coverings upon the patient be daily removed so far as is possible, or at least the bed-clothes and body-linen if he wear such. 10. Give directions that the sick-room be frequently sprinkled with rose-water mixed with vinegar, by waving in the air a long-handled sprinkling-brush saturated with it. It were also good that in the sick-room there be placed several wide-mouthed vessels with warm rose-water and vinegar, so that their vapours should mingle more intimately with the air. 11. It is advisable so long as thou art in the house constantly to smell a sponge soaked in vinegar in which a fine powder of cinnamon, spice and similar substances is suspended. Take heed of the most urgent necessities of the moment and of the most pressing circumstances, taking thought whilst visiting the patient how thou may'st curtail thy stay in his house. 12. It is advisable to walk slowly, avoiding haste and exertion on thy way to a patient's house, so that thou may'st draw breath as little as possible. 13. It were well to carry about with thee strong perfumes and exhalations, choosing them according to the season of the year, hanging them upon thy clothes and under thy mantle, so that their scent pervade thy whole person and reach thy nostrils. 14. It were well if in the sick-chamber fanning should take place ; two or three large fans being kept and used with open windows and doors, so that as far as possible all the air in the room be renewed, this taking place repeatedly by day and once at midnight. 15. It is a good thing to hang in the room cold, pleasantly scented substances, such as oranges, roses, lemons, etc., these being also placed in the patient's bed, whilst he should wear jewels on his fingers, these being most useful. 16. Thou should'st also wear precious stones on thy fingers."

In the works of the earlier-mentioned commentators and compilers surgery is indeed usually mentioned to a greater or less extent as well as

¹ This rests on the view of Avicenna and Averroes, that contagia rise upward.

internal medicine, but mostly it represents only the fruits of reading by theorists, quite exceptionally the result of genuine experience. An insight into contemporary surgical knowledge is, on the other hand, afforded by the literature of the surgical specialities, the best writings upon which were the work of men experienced in both branches of the healing art, but who by preference practised surgery (physician-surgeons).

It is no mere accident that the most distinguished of these should have hailed from France, where Lanfranchi had scattered seed freely, and where the Collège de St. Côme also rose to fame as a teaching institution. These were Henri de Mondeville and Guy de Chauliac.

Henri de Mondeville was born in the second half of the thirteenth century, presumably in a Normandy village, and appears to have received his education partly in Bologna, partly in Montpellier and Paris. His masters in surgery were Theoderic, Lanfranchi and Pitard, the last of whom he describes as "*peritissimus et expertissimus in arte cyrurgiae*". Probably at the recommendation of the latter, Henri came, before 1301, to the court of Philippe le Bel as one of the four body-physicians to the king. His activity as a teacher attracted many pupils, but suffered many and prolonged interruptions through his multifarious occupations, particularly on account of the necessity on his part of accompanying the king upon journeys and in campaigns. These obstacles also were the cause of his "*Cyrurgia*", begun in 1306, only making slow progress and not having advanced by 1312 beyond the two first treatises. The work was unfortunately destined to remain unfinished, for when in 1316 the author was at last enabled, undisturbed by official duties, to resume his interrupted labours, an affection of the lungs with which he was seized forced him to lay down his pen.

Guy de Chauliac, probably born in the last decades of the thirteenth century in Caulhac, a village on the borders of Auvergne, was early destined for the Church, and studied first in Toulouse, later in Montpellier, receiving further education in Bologna and Paris. The greater part of Guy de Chauliac's life was passed in Avignon in the service of three Popes, Clement VI., Innocent VI. and Urban V., according to his own designation as "*medicus et capellanus commensalis*". His chief work upon surgery (published as he himself put it, "*ad solatium senectutis*") saw light in 1363.

Henri de Mondeville, who takes his place with the greatest surgeons of the thirteenth century and who carried on in particular the traditions of Theoderic and Lanfranchi, left behind him an unfinished text-book which, whilst conforming closely to the scholastic form, betrays in its contents the practitioner inclining towards unbiassed observation and making his judgements mainly upon the basis of his own experience. Great innovations in pathology and therapeutics or creative ideas will be sought in vain in this work, which always relies upon the authorities, and which is packed with erudition and literary knowledge; but there is to be found in it a certain independence asserting itself in the choice of authoritative doctrines in surgical method and technique and in the employment of dietetic and pharmacological therapeutics. Henri is a convinced follower of a non-suppurative method of wound-treatment; in cranial injuries he adopts a more expectant mode of treatment, without being afraid of operation; he opposes the routine

starvation of the wounded, etc. With a rational point of view in science and practice he unites a humane temperament, almost free from superstition, a noble professional enthusiasm, a meritorious didactic skilfulness. With all reverence for antiquity, he was a steadfast believer in the possibility of further progress and did his best to contribute to it.

Henri's Surgery, which, in consequence of the untimely death of its author, remained a fragment, necessarily passed out of general use on account of its incompleteness, and a few decades later there appeared a new work which, whilst not standing higher from the point of view of quality, had the advantage of dealing with the subject as a whole, without gaps, and making use of all precedent literature. This work is the "*Inventarium s. Collectarium artis chirurgicæ medicinæ*", or, to give it its later name, the "*Chirurgia Magna*" of Guy de Chauliac.

The circumstance that Guy de Chauliac, by means of his really exhaustive, convenient, critically inspired collection of the accumulated material of surgical knowledge, provided as did no other for the necessities of his contemporaries and of future generations, underlay the fact that his text-book maintained its high reputation as a classic, as the beacon-light of surgery even beyond the sixteenth century, not only in France, but partly also in other countries. Even to-day perusal of this work conveys the impression of an exceptionally erudite author, of an enlightened and dexterous operator, of an experienced physician, thoroughly educated in both branches of medicine, of a man of most enlightened mind who, with a genius for his art, made the highest moral and intellectual demands upon his disciples. He is, however, only so far to be considered the chief representative of mediæval surgery in that he brought it to its consummation by integration and subjective conquest of its contradictions. Guy surpassed his great predecessors, from whose works he was in a position to draw freely, Saliceto and Theoderic, Lanfranchi and Henri de Mondeville, neither in ideas and fresh discoveries, nor even in wealth of experience; upon certain fundamental questions, *e.g.* upon non-suppurative treatment of wounds, he even takes a retrograde step. Like his antecedents—following whom he says, "*sequuntur se sicut grues*"—he also is caught in the toils of belief in authority and is swayed by traditional pathogenetic views, doing profound homage to astrology and many therapeutic follies. Guy modestly describes his work as it actually is, a compilation provided with original notes, although its didactic consequences were important enough to earn for its originator a sure historical position. This rests upon the fact that Guy de Chauliac by his excellent work laid the foundation of the supremacy of French surgery.

The admirable surgical teaching obtainable in Paris and Montpellier

soon exercised the most favourable influence upon the surgery and operative art of the neighbour nations. Proofs of this are to be seen in the writings, distinguished by literary knowledge, wealth of observation and many advances in technique, of the Flemish author Jehan Yperman and the Englishman John Arderne.

Jehan Yperman obtained his education in Paris at the end of the thirteenth century under the guidance of Lanfranchi. After his studies were ended he settled down in his own home. He acquired such fame through his dexterity that his name, preserved in popular tradition, is still used in his own land as the attribute of a skilled surgeon.

John Arderne, the *chirurgus inter medicos*, as he calls himself, was born in 1307, and probably obtained his education in Montpellier. In the year 1316 he accompanied the English army to France as "Sergeant-surgeon", and took part in the battle of Crécy. From 1349 to 1370 he practised as a physician in Wiltshire and Newark and then migrated to London, whither a considerable reputation preceded him; there he practised until 1399. His "*Practica*" is for the most part yet unprinted, the contents, in many ways highly interesting, deal mainly with surgery, to a less degree with internal medicine.

Even a perfunctory survey suffices to show that, within the sphere of Arabistic scholastic influence, it was mainly the leading surgeons who showed intellectual activity and unimpaired freshness of outlook, whilst the lamentable divorce of internal medicine from surgery, particularly encouraged by the Paris faculty, certainly reacted more unfavourably upon the former than upon the latter.

Just as the increased attention devoted to anatomy, corresponding with the growing needs of practice, was mainly due to the powerful initiative of the surgeons (William of Saliceto, Lanfranchi, Henri de Mondeville), so did surgery alone profit from the revival of study upon the human cadaver.

In Salerno as in Bologna the surgeons were particularly interested in the development of anatomical study, and, as already mentioned, William of Saliceto made the first attempt to apply to surgery, by means of a text-book, the discoveries of anatomy, the main source of his knowledge being Avicenna. The anatomy of Riardus Anglieus also shows the imprint of Avicenna, and is a work which is to be regarded as the earliest evidence concerning anatomical instruction in the school of Paris. As regards Montpellier Lanfranchi appears to have been the first to give an impulse to a more active development of anatomical study. In the year 1304 the accomplished surgeon Henri de Mondeville delivered anatomical discourses there, mostly derived from Avicenna, and was the first to introduce therein instruction by inspection, making use for demonstration purposes of a model of the skull and thirteen anatomical plates, only the description of which has unfortunately survived. These anatomical discourses, amplified and altered, constitute the first treatise of his Surgery. The three anatomical sections of an English MS. by an unknown author dating from 1392 betray in arrangement and expression their origin from Henri de Mondeville.

Up to the fourteenth century practical instruction in anatomy, apart from demonstrations upon superficial parts, was entirely based upon zootomy, chiefly of swine.

In order to discover the cause of suspicious deaths or epidemic diseases, it had, at least in Italy, been, as early as the thirteenth century, here and there customary to undertake autopsies. The first authentic record relates to a judicial autopsy undertaken in Bologna in the year 1302, in order to ascertain the cause (suspected poisoning) of death.

In the development of human anatomy certain prejudices, deeply rooted in the popular

mind, constituted a formidable obstacle; the belief that the Church had expressed itself as fundamentally opposed to cadaveric section and thereby obstructed the progress of science, rested upon a misconception. The Bull in question of Pope Boniface VIII. of the year 1300 was only directed against the custom, dating from the Crusades, of dismembering the corpses of prominent men and boiling them in order to send the bones, freed from the soft parts, to their homes for burial. Such a burial "more teutonico" was, for instance, given to the Emperor Barbarossa and the bishops, princes and nobles accompanying him, the Duke Leopold of Austria, King Louis IX., Philip the Bold and his wife.

Exactly when, after many centuries' interval, human dissection was once more undertaken, cannot precisely be determined; we only know that in Italy, at the commencement of the fourteenth century, those fundamental conditions already existed which made possible anatomical demonstration upon bodies of criminals for purposes of instruction.

The merit of having once more opened up this source of knowledge, closed since the days of the Ptolemies, must be ascribed to the school of Bologna, and primarily to Mondino de' Luzzi, who taught medicine therein. The latter took the epoch-making step from the *Anatomia porci* to systematic dissection of human bodies and founded its technique.

Mondino was the most noted dissector of this epoch, indeed the chief representative of anatomy in the entire later Middle Ages. By means of his demonstrations upon the cadaver he exercised the most powerful influence upon his contemporaries; through his "*Anatomia*," a compendium published in 1316, which contains an introduction to methodical preparation of specimens and thereby dealt with pathology, particularly surgical, he became the instructor of many medical generations. The *Anatomia Mundini* was introduced into the majority of mediæval academies; constantly translated and annotated, the book maintained its authoritative significance undiminished until the middle of the sixteenth century.

MSS. of the "*Anatomia Mundini*" are to be found in all the more important libraries; some twenty-five editions occur in print, the first in 1478, the last in 1580. Several editions are provided with wood engravings.

In the introduction Mondini explains the purely practical purposes of his work, which was meant to serve as a text-book for students and to contain, not only anatomical descriptions and anatomical technique, but also physiological, pathological and therapeutical dissertations (on an anatomical basis). Dissection was performed upon the body of one beheaded or hanged.

The "*Anatomy*" begins with the abdomen. The abdominal wall—"Mirach"—consists of skin, subcutaneous tissue, panniculus carnosus, muscles with their tendons, and the peritoneum—"Siphac." In making a preparation a vertical incision is made from the xiphoid process to the symphysis, to which is added a horizontal incision through the navel to the two sides of the back. The abdominal cavity is only provided with fleshy walls in order that it may expand unhindered in case of pregnancy or dropsy. There are three varieties of muscles, longitudinale, latitudinale and transversale; by associated action with the diaphragm the abdomen is compressed "quasi inter duas manus". In the description of the peritoneum and omentum is included that of paracentesis (opening of the abdominal cavity by means of a razor after pushing aside the skin near the linea alba, evacuation by means of a cannula, warning against hasty evacuation), together with that of abdominal injuries (subsequent

enlargement of the wound in order to replace prolapsed parts, resection of omentum, suture by ants; in suture of the abdominal wound the peritoneum and the abdominal muscles are to be included alternately in the silk stitch). In the section upon the colon the differential diagnosis between intestinal and renal colic is discussed. In order to demonstrate the spleen some of the false ribs on the left side must be removed. The liver of man is larger than that of animals and is placed higher in the cadaver than in life. The "penulae" of the left lobe of the liver, which in many animals grasp the stomach as though with fingers, are not always separated from one another in man; each lobe is formed of blood-vessels interlacing like a net, the liver substance in the spaces of the net resembles coagulated blood. The reason for the duplication of the kidneys and the pathology of these organs receive detailed attention from Mondino. The ureters open by means of several small apertures obliquely into the bladder. In the chapter upon the uterus the error is perpetuated of the seven chambers (three on each side, the seventh in the middle), but the migration of the uterus is on the other hand denied. The uterus increases in size not only in pregnancy but also at the time of menstruation. Here occurs the paragraph historically so important wherein Mondino mentions the dissection undertaken in 1315 in order to investigate the difference in size between the virgin and parous uterus. The uterus and breasts are connected by means of blood-vessels. To the description of the testicles and spermatic cords are added observations upon herniae and their radical treatment. Mention is made of lithotomy in the chapter upon the anatomy of the bladder.

The second part of the anatomy deals with the thoracic cavity and the neck, breasts, thoracic muscles, osteology and syndesmology of the thorax, pleura, mediastinum, diaphragm, heart, lungs, vessels of the neck, tonsils, mouth, oesophagus, trachea, epiglottis, tongue. In the description of the pleura is included a detailed excursion upon pneumonia and pleurisy (*vera et non vera*). The mediastinum serves amongst other purposes to prevent the passage of an empyema from one side to the other. There is an exceptionally detailed description of the heart. The lung tissue is composed of the ramifications of the "arteria venalis", of the "arteria trachea" and of the "vena arterialis". The uvula serves as a receptaculum for the "superfluitates" descending from the cranial cavity, further to keep the cold air from the lungs, for which reason removal of the uvula in diseased conditions is advised against and cauterisation at most recommended.

The third part of the anatomy deals with the cavity of the skull. The descriptions are superficial and full of the errors of the ancients. Seven coats are described to the eye and three humours. In the chapter on the anatomy of the ear Mondino says that the structure of the petrous bone would come more fully to view if it were permissible to boil the bones—a procedure which must, however, be omitted on account of its sinfulness. The end of the work deals with the spinal column and its extremities, the peculiar nature of the terminology exciting surprise. The muscular system as well as the peripheral nerves and vessels remain unmentioned.

Mondino's epoch-making work is written from the point of view of the dissected human body,¹ it possesses the great advantage of introducing the reader by means of anatomical preparations to a knowledge of the structure of the body—"si excarnando procedas" is the characteristic expression of the author—but the contents prove only too clearly how little service to science even the best instrument is if not employed in the spirit of free investigation. Mondino's *Anatomia* never shakes off inherited tradition;

¹ It is highly probable that Mondino did not wield the scalpel with his own hand, but that a dissector acting under his instructions undertook the autopsy. The expression "anatomizavi" rarely signifies amongst mediæval anatomists anything but "I ordered dismemberment", or "I was present at dismemberment".

it contains nothing more than the material derivable from the Arabs and from certain pseudo-Galenic compilations, without the smallest fresh observation, without the least whisper in correction of deeply rooted error. The demonstrations of the Bolognese on the post-mortem table—in Arabic nomenclature, interlarded with exploded teleology, with added surgico-pathological observations—consisted of the old imaginary anatomy, which he never for a moment doubted or put to the test, as is clearly indicated, for instance, by the statements concerning the alleged third ventricle of the heart or the seven cells of the uterus. To make ocular demonstration of dead learning to the best of his ability, crudely to familiarise the physician with the “seats of disposition”, constituted his end and aim, whilst the intrinsic value of unprejudiced anatomical investigation as the key to fresh fundamental discoveries remained a sealed book to him. Thus even the art of dissection, which would appear imperatively to demand the use of the senses, became for the time only a fresh sphere of influence for that overwhelming suggestive power which put tradition so completely beyond the reach of criticism.

Medical research as such derived no advantage worth mentioning from dissection, and for a long time almost the whole sequel to Mondino's activity lay in the fact that occasional demonstrations upon the human cadaver—so far as the prevailing difficulties made it possible¹—were introduced into the curriculum of the academies, though, indeed, at first only as an embellishment. Notably was this the case in Bologna, where Bertuccio zealously built upon the foundations laid by Mondino and had as pupil no less a man than Guy de Chauliac. In the course of the fourteenth century the example of Bologna was followed by Padua and other Italian schools.²

From the last third of this century onwards, dissection of bodies for purposes of instruction took place also in Montpellier,³ whereas for long there is no information concerning Paris.⁴ Upon German soil Vienna was

¹ In spite of the fact that facilities were officially afforded for the supply of bodies of criminals for scholastic purposes, on account of many restrictive enactments there existed an almost constant shortage of material, so that, as a substitute, even into the sixteenth century, recourse was had to dissection of swine. Here and there the reprehensible practice of body-snatching was resorted to in order to eke out the deficiency.

² According to later designations a distinction has to be drawn between an “*Anatomia publica*”, i.e. a public dissection, for the benefit of the community at large, and an “*Anatomia privata*”, i.e. an autopsy undertaken for the benefit of individual physicians or students, or for legal purposes.

³ Here the anatomy of Guy de Chauliac took the place of Mondino's compendium. The statutes, ostensibly of 1340, make mention of autopsies, but the first legal justification for them dates from 1376 or 1377.

⁴ The surgeons certainly undertook four autopsies yearly, but information concerning those of the medical faculty are not to be found earlier than the second half of the fifteenth century. With regard to Spain, privilege was granted by Juan I. of Aragon, in 1391, to the University of Lérida to dissect the body of a criminal every three years.

the first arena of public anatomy, undertaken by the Paduan professor, Galeazzo de St. Sophia (1404).

It cannot be denied that the attempt was occasionally made to increase the knowledge of disease by means of anatomy and that attention was paid to accidentally found bodies, but there is no question so far of any influence of anatomy upon pathology. The following facts, however, are of interest from an historical point of view. In Siena official pathologico-anatomical demonstrations took place in 1348: permission was given to the physicians of Ntra. Sra. de Guadalupe in Estremadura to undertake autopsies in order to ascertain the cause of death. Gentile da Foligno in 1341 found a gall-stone in performing an autopsy; Joh. da Tornamira a vesical calculus when embalming.

Since the practical study of anatomy—following Mondino and his successors—did not in the least shake the supremacy of Arabism, it need not cause surprise that that literary event proved ineffectual which in retrospect acquires an importance not to be depreciated—the translation undertaken by Nicolo Regino of the Galenic writings directly from the Greek originals.

Homage was indeed paid to Galen with the lips, but it was Arabism under the banner of the Pergamene which maintained a real supremacy. The medical literature of the greater part of the fifteenth century is still saturated with the spirit of Avicenna, of Rhazes and Ali Abbas, of Messuë, etc., the reputation which the antecedent Western authors—the pupils of the Arabs—had in the meantime acquired through the better organised university instruction, materially strengthened the position of doctrinairism. The tendency persisted to interpret in scholastic manner knowledge already familiar, to round off into compendious form for didactic purposes what were held to be established truths, and only here and there, amongst the most enlightened, was the still small voice of individual observation, of independent experience to be heard—a rustling amongst dry leaves which, indeed, heralded to a practised ear the on-coming storm of intellectual upheaval.

Under a deceptive superficial appearance of identity the chief schools hide certain shades of difference, the clearer recognition of which is little assisted by the so far imperfectly revealed and inadequately investigated literary material.

The free, practical tendency of Montpellier found its representative in the Portuguese Valesco de Taranta, whose *Philonium s. Practica medica* deals clearly, and for didactic purposes exhaustively, with the entire range of medicine (inclusive of surgery), gives prominence to facts, and, in spite of its being mainly a compilation, evidences a sense of clinical observation and many therapeutic novelties. Together with the *Introductorium* of Joh. da Tornamira this compendium carried far afield the fame of the old school and enjoyed high esteem until the seventeenth century.

The most prominent representative of Paris was Jacques Despar (Jacobus de Partibus), whose endeavour it was as writer and teacher to spread abroad his profound knowledge of Avicenna. The commentaries of this author, who also did much for the general development of the medical faculty of Paris, stand alongside those of the Italians.

As regards the Italian schools, which were in close intercommunication and therefore constituted an intellectual unity, their chief representatives were entirely Arabists of strict observance; nevertheless they show certain differences, in so far as some give themselves up wholly to dialectic discussions, whilst others devote increased attention to special cases and astonish the reader by touches of unprejudiced, clinical or even anatomical thought.

The most prominent place in the literature is characteristically taken by the clinical compilations (*Consilia*) with their wealth of observations; but personal experience is also evidenced in many of the *Compendia* of the time, even in the individual commentaries. It would take us too far to go into details of great interest in the history of many special branches, only the more important authors can be mentioned.

The majority of these were connected through their teaching principally, or at least transitorily, with the rising school of Padua, as, for instance, the brilliant dialectician Ugo Benzi (Hugo Senensis) and Antonio Cermisone, who bequeathed highly esteemed *Consilia*, the commentators Giovanni Arcolano and Cristoforo Barziza, and, moreover, the two great, really progressive practitioners Michele Savonarola and Bartolomeo Montagnana.

The "*Practica*" of Savonarola, which for more than two centuries was made use of as a guide by Italian physicians, marks the commencement of the revolt, not against Arabism, but against the scholastic mode of work. It deals, enlivened with reports of cases, with the whole of medicine, following the pattern of Avicenna's "*Canon*", and in a surprising manner gives prominence to evidence of the senses, clinical observation and descriptions of disease, without ever entirely breaking with inherited tradition. It is significant that the author attaches no great importance for practice to the doctrine of the elementary qualities and, as a result of independent investigation, takes into consideration the influence of climate upon disease and its treatment. With justice may Savonarola in the dedication of his book—to the Paduan physician and philosopher Sigismundus Polcastrus—express the hope that his experience may be more useful to his younger colleagues than the customary dialectic quibbles ("*juniores practici plus proficere posse quam his dialecticis argumentationibus quibus in platearum angulis vane se populo ostentant*").

The long-esteemed "*Consilia*" of Montagnana manifests unusual power

of observation and diagnostic resource and, which is specially remarkable, endeavours to connect individual local pathological manifestations with constitutional disease, whereby the traditional topographical pathology was discredited. The revolutionary mode of thought of this gifted man was doubtless influenced by anatomy—Montagnana being able to boast of having been present at fourteen autopsies.

A glaring contrast to the above-mentioned works is provided by the compilation, entirely lacking in any independence, of the Milanese Concorreggio. On the other hand, the compendia or consilia of Ant. Guainerio, of Ferrarinda da Grado, of Marco Guatenaria, the latter of whom are to be considered mainly as representatives of the school of Pavia, and those of Baverio contain a large number of sound, personal observations.

Great attention was paid in Italy to surgery as well as to internal medicine, although, indeed, we find few traces of originality. The most important authors to be considered in this respect are Pietro d' Argellata in Bologna and Leonardo da Bertapaglia in Padua. The surgery in six books of the first-named is chiefly founded upon a most careful study of antecedent literature, but contains much of interest in its case-reports, and is distinguished by vivid descriptions of the most usual operations, amongst which resection of bones may particularly be mentioned. Pietro d' Argellata cannot entirely be exonerated from the reproach of preferring medicinal therapeutics before operative, but this holds still more true of Bertapaglia, who surrenders himself wholly to Arabic polypharmacy and is greatly lacking in careful observation. His surgical masterpiece is no more than an elaboration of the fourth book of Avicenna's Canon from a strictly Arabistic point of view, and at the utmost makes some contributions to the treatment of wounds and ulcers as well as to the technique of resection; the fantastic temperament of the author is particularly evident in the seventh treatise, which deals exhaustively with the astrological relations of surgical affections.

The learned surgeon-physicians at the close of the Middle Ages were far surpassed in operative boldness and dexterity by only empirically educated scions of certain Italian surgical families, who for generations had guarded as the secrets of their craft the technique of herniotomy, of lithotomy, treatment of stricture, cataract operation, etc. To these the Norcians and Precians, as well as to the members of the Sicilian family of Branca (settled in Catania), we owe the revival of plastic operations (rhinoplasty) which in the middle of the fifteenth century were rescued from oblivion to become the common property of science only at a much later date.

The names Norcian and Precian arise from the town Norcia (province of Perugia), or some places in their vicinity, Castello and Contado delle Preci. The origin of the activity

of these families is lost in the darkness of the Middle Ages. From the fourteenth century onwards some members of them come to the fore as famous physicians; from the sixteenth onwards there appear writings upon surgical subjects, from the hands of Norcians and Precians, and even into the eighteenth their descendants practised as lithotomists and oculists, partly as public officials in the largest Italian towns. Naturally a crowd of ignorant quacks paraded as Norcians.

The earliest record of a rhinoplasty performed in this period is to be found in the work of the Neapolitan historiographer Bart. Facio. He reports that a vulnery surgeon, Branca of Catania in Sicily, restored deformed noses by transplantation of skin from the forehead or cheek; further, that his son Antonio, in order to avoid the disfigurement of the face, used to transplant the skin from the upper arm, and, moreover, had devised a method of cheiloplasty and otoplasty.

In addition to the two main branches of the healing art some of the specialities are represented in the literature, such as ophthalmology and pediatrics, upon which latter subject Paulus Bagellardus wrote a monograph, also dietetics and balneology, materia medica and pharmacy (Christoforo de Honestis, Saladinus de Asculo, Quiricus de Augusti, Joh. Jac. de Manliis de Bosco) and even toxicology (Santes de Ardoynis).

Having reached the end of the epoch, it should be mentioned that, from the early Middle Ages onwards, there existed, in addition to the Latin literature, writings upon natural history and medicine in the vernacular which—apart from translations intended for educational purposes for the use of the unqualified surgeons and a few surgical compilations—are mostly of a popular or semi-popular character. These literary products possess no small value from the point of view of the history of civilisation and language, but for the history of medical science they are of importance only so far as they are able to throw some light upon many hidden by-ways of medical tradition. From the standpoint of chronology and partly from that of their contents they come as a sequel to the monastic literature, although, corresponding with the lapse of time, Salernitan medicine constitutes the chief source for the dietetic and therapeutic sections.

The part played by vernacular medical literature was the more important the greater the distance from the centres of mediæval scientific medicine, and made itself therefore more felt in Latin than in Germanic countries.¹ As late as the fifteenth century medicine in Germany is represented mainly by German writings, German surgery at this time being represented exclusively by a work in the mother-tongue, of interest from several points of view (rhinoplasty, narcotic inhalations), the “*Bünth-Ertzney*” of Heinrich von Pfolspundt.

¹ A special position is occupied by medical literature in the Celtic tongue (Irish, Gaelic, Cymric), which sprang from the old medical families in Ireland, Scotland and Wales. Examination of this literature, existing only in MS. form, shows that the autochthonous art of healing was closely in touch with mediæval medicine throughout Europe.

Whereas in Germany at the expiration of the Middle Ages scholastic Arabistic medicine constituted at least a veneer—thanks to its dissemination through physicians who had studied abroad and to the increasing number of educational centres in the newly-founded universities—medicine in the Scandinavian countries at the same epoch remained for the most part stationary, at the early mediæval stage, not till the sixteenth century rising above this level of literary production, of which the earliest monument is the herb-book of Henrik Harpestrang (thirteenth century).

Medicine in the Scandinavian countries was rooted in pan-Germanic folk-medicine, partly developed upon independent lines, and, after the introduction of Christianity it became increasingly subject to the influence of European scholastic medicine, although it was hardly before the sixteenth century that it reached the European mediæval level.

As elsewhere, in the earliest times and for long after, pathological and therapeutical conceptions were completely dominated by demonism, heathen formulæ undergoing gradual transformation and distortion in a Christianised sense; the empiricism of many generations accumulated a mass of remedial measures and means, amongst the latter of which those of vegetable origin predominated. The healers were for the most part women with knowledge of magic and herbs (particularly in treatment of wounds and obstetrics), magicians (medicine-men, equipped with a magic-bag, containing all kinds of wonder-working articles such as hair, nails, etc.), occasionally also—a peculiarity of the North Germans—kings, to whom the gift was conceded of exorcising certain diseases by a simple touch.

After the tenth century professional, empirically educated physicians, *i.e.* wound-healers, took chief place, and were hardly displaced when the clerics practised the art to a limited extent and introduced early mediæval monastic medicine into the North. At a later date foreign physicians probably settled down here and there in the North, at any rate as court physicians; *per contra* in the last centuries of the Middle Ages young men (certainly from Denmark) travelled to Paris, Montpellier or Bologna in order to obtain medical education there. It may be added that eventually barbers and bath-keepers also undertook venesection, cupping and treatment of broken limbs and dislocations.¹

As appears from the sources available, quite a number of internal diseases were known, together with not a few remedies directed against them, and it is a matter of great interest that surgery should have attained a relatively high level of development. The most important part of the treatment of wounds consisted in purification, examination by inspection and palpation, by means of a probe, arrest of hæmorrhage (tamponage with shreds of linen, compresses, cautery, stitching), and the use of salves, plasters and dressings; the same held true of the treatment of ulcers. Frequent mention is made of the performance of venesection, extraction of arrow-heads and setting of fractures.

The oldest medical work of the North is the Danish pharmacopeia of Henrik Harpestrang. It consists of two herb-books, mostly derived from Maces Floridus, and a stone-book, an elaboration of Marbod's Lapidarius.

Looking backwards after this digression upon Western medicine in the later Middle Ages, it becomes apparent that in its highest development it is only a replica of Arabic medicine, a copy in which the many deficiencies of

¹ It is remarkable that in the old Swedish provincial laws a definition is given of people to be considered legitimate physicians: "If a man should inflict a wound upon another, he shall summon three legalised physicians, one of whom, at will, may be chosen". A legally recognised physician is one who has successfully treated a wound made with iron, a broken bone, a penetrating wound, a cut-off limb, a punctured wound with two openings.

the model only stand out in heightened relief, whilst the scanty advantages are nearly blotted out.

Late mediæval medicine is an edifice outwardly imposing through strict uniformity and ordered logical construction, but its real value amounts for the most part to little more than a formulated ignorance.

Anatomy was based, instead of upon real investigation, solely upon unverified and accepted, half true or wholly false statements of Aristotelian or Galenic writings. Physiology was composed of fictions which the ancients had concocted and the Arabs and schoolmen had subtly elaborated. General pathological doctrines could make no progress in face of the doctrine of qualities of the most extreme humoral pathology. Special pathology—although no other principle of subdivision was known but the crudely topographical one “*a capite ad calcem*”—made only slight and isolated advances, the chief end and aim being not so much unbiassed description of syndromes as the inclusion of diseases in traditional classifications.

Materia medica embraced an immense number of substances arranged with pseudo-scientific accuracy according to their elementary qualities and degrees, their efficacy, however, resting upon authoritative tradition, not upon fresh critical experience. Therapy was founded in blind faith upon theoretical premises, from which the treatment of the concrete individual case was mechanically deduced; it laid, indeed, considerable stress upon dietetic rules, but degenerated into incredible polypharmacy and was exaggeratedly addicted to derivative methods.

Devoid of all true individualism, untouched by sceptical proclivities, the mediæval physician alike in thought and action was caught in the rut of tradition—not observation, learned pedantry alone served as his guide.

Clinical intervention began with an exhaustive anamnesis which by dint of methodical interrogation sought to elicit the age, sex, vocation and mode of life of the patient, his subjective sensations and their seat, the cause, duration and course of the disease and many other matters. With the establishment of the anamnesis was connected inspection (habit, colour of skin, etc.), and finally palpation. The extremely detailed investigation of the pulse constituted the main feature, inspection of secretions and excretions (expectoration, vomit, urine, fæces) the termination of the objective examination of the patient. On prognostic and therapeutic grounds the chief task was to determine the temperament and vital condition of the patient, the disturbances of function and their seat and the dyscrasia underlying the disease.

Amongst diagnostic methods urinary inspection, uroscopy, was developed

to the highest degree and played a particularly important, if not the chief, rôle.¹

In fourteenth and fifteenth century MSS. there are to be found coloured representations which elucidate uroscopy, as far as the tint of the urine is concerned. These are the so-called urine-glass dials (uroscopic dials). Such a dial is depicted in the National Library in Paris. A central trunk bears seven round discs attached to stem and branches, and arranged in a circle round these are twenty urine-glasses, each with corresponding coloured contents and text on the circumference. The uroscopic dials differ considerably in type and accompanying text. Deductions were drawn from the colour of the urine as to the prevalence of one or other of the four qualities or cardinal humours or, as may be learnt from the inscriptions, as to the degree of coction of the humours.

Treatment was partly hygienic and dietetic, partly medicinal and surgical. It was based upon the ætiological, pathogenetic ideas of the theory of elementary qualities, upon the humoral doctrine, and had as its guiding principle that of "*Contraria contrariis*". The nature and degree of therapeutic interference was dependent upon the individual circumstances of the patient.

Expressed in mediæval medical language, the following factors came under consideration in therapeutics. (1) The (seven) "*res naturales*" (elements, temperaments, primary humours, parts of the body, forces, functions, vital spirits), *i.e.* the anatomico-physiological conditions and their disturbances; (2) the (six) "*res naturales*" (air, meat and drink, movement and rest, waking and sleep, excretion and retention, emotions), and their (five) *adnexa* (season, climate, sexual life, profession and mode of life of the patient, baths), *i.e.* the hygienic and dietetic conditions; (3) the (three) "*res practernaturales*" (diseases, causes and signs of the same), *i.e.* the pathological conditions in the narrower sense of the term.

Medical prescriptions were constantly distinguished by exceptional care in hygienic and dietetic directions, taking the minutest details into consideration; at times these constituted the entire therapy. As a rule, however, only too frequent and free use was made of medicaments—no important author dispensed with an antidotarium as an appendage to his work. In medicinal treatment preponderating use was made, following the Arabic fashion, of the most complicated mixtures—simples were relatively seldom employed—which is hardly surprising when the number of indications is taken into consideration which each individual case presented, in accordance with the highly complex pathological conceptions of the day. Thus, for instance—to mention only a few points—the existing "*intemperies*"

¹ As evidenced by old pictorial representations, the cup-shaped urine-glass, the "*urinal*", was the real emblem of the medical art in the Middle Ages and, in spite of warnings on the part of the medical authorities, practitioners often founded their diagnosis and treatment upon uroscopy alone. Medical consultation not infrequently consisted only in the "*water*" of the patient being brought by a messenger for inspection. The uncertainty of the method naturally paved the way for quackery, even for the most barefaced deception; lying charlatans strengthened ever anew amongst the populace the belief that the initiated could discern everything from the urine; many a capable, enlightened physician, against his own convictions, may well have been forced, by stress of dishonest competition, to meet the follies of the public half-way. In Germany in particular the belief in uroscopy was so deeply rooted that sharp practitioners employed a urine-glass as a sign.

was to be combated according to its elementary quality; the abnormal quantity or admixture of the humours was to be obviated by attenuation, resolution or purification, by derivation or evacuation; local influences in addition to general were to be exerted whereby the entire constitution and strength of the patient, the temperament of the diseased organs, etc., should be observed, whilst in prescribing pharmaceutical considerations be likewise borne in mind. The fulfilment of these many conditions was apparently facilitated by the imaginary but rigidly systematic therapeutic doctrine—with its numerous and highly differentiated remedies arranged into categories according to qualities and degrees.¹

Of the methods of exhibition the “Potio” or medicinal draught was the favourite; of remedies, in accord with humoral pathology, the principal were “emetica”, “laxantia” and “purgantia”. Whilst these came into consideration when the intention was to influence the phlegm or yellow and black bile, quantitative and qualitative improvement of the blood was undertaken by means of venesection.

Directions concerning the employment of venesection or phlebotomy take up considerable space in the medical literature of the Middle Ages—proportionately to the high esteem in which this measure was held; there are, however, considerable variations amongst different authors, which may be simply explained by the fact that the authoritative Galenic, and still more Arabic, instructions left much to be desired on the score of clearness, which opened the door to subtleties of interpretation. The fundamental rule, to withdraw by means of venesection only superfluous blood, but to eliminate noxious humours by purgation, was not universally adhered to, phlebotomy being also undertaken under certain circumstances in the case of quantitative predominance of one of the three other humours, *e.g.* of black bile, or in order to obviate putrescence of humours or to promote evacuation of matured disease products. Apart from correction of humoral anomalies, venesection was undertaken in order to cool the over-heated blood, in order to attract the *materia peccans*, in order to counteract hæmorrhages (*e.g.* hæmoptysis, hæmorrhoids), or *per contra* to promote the flow of menses. There were thus but few pathological conditions in which, according to contemporary conceptions, phlebotomy was not, under certain conditions, indicated, indeed frequently during the course of one and the same acute affection repeated letting of blood was ordered. No less numerous, however, than the indications were the contra-indications against venesection; the most important rôles in this respect were played by climate, season, direction of wind and time of day, age, sex, constitution, mode of life and strength of patient, danger and stage of disease. It is noteworthy that revulsion (*i.e.* venesection at a distance from the diseased part) was given the preference over derivation (venesection in the neighbourhood of the diseased part), and that the operation was performed less often upon the diseased side than upon the opposite side of the body.

Detailed directions are found in the literature concerning the régime of the patient before and after venesection, upon the technique of the operation, but greatest stress was laid upon the spot for its performance and the suitable choice of veins. Founded upon the doctrine of Galen, who discussed fantastically and in doctrinaire manner not only the origin and course, the anastomoses, but also the relations of vessels to certain organs, an entire system had been

¹ Physicians did not yet write prescriptions, but ordered the individual ingredients of their medicines by word of mouth from the apothecary; they handed the drugs themselves to the patients in beakers of tin or silver, which were returned to the dispensary after use.

gradually developed in keeping with which one or other vein was opened according to the seat of disease, or the general or local nature of the effect aimed at. The authorities generally enumerated 26-28 veins, whilst indicating the parts of the body with which they were directly or indirectly in connection.¹

In the head alone are enumerated thirteen vessels; of the veins of the upper extremity the cephalic, median, basilic, the inner branch of the cephalic, known as the "funis brachii", and the vena salvatella come into consideration; of the veins of the lower extremity, principally the popliteal, the saphena major, and the so-called "vena sciatica" (external saphenous). Many MSS. contain a clearly-indicating venesection figure ("vein-man"), with explanatory text.

In the same category of remedial measures were included: arteriotomy (only performed on the temples and behind the ears), cupping (dry or wet) as a substitute for venesection (vicarius phlebotomiae), the application of leeches, and the cautery, vesicants and setons. These methods were all employed from the point of view of humoral pathology in order to counteract quantitative and qualitative humoral anomalies, to bring about derivation or evacuation of the materia peccans.

It is characteristic of later mediæval medicine that uroscopy constituted the most important diagnostic method, purgation and phlebotomy the sovereign mode of treatment, nevertheless it receives its most distinctive impress from the fact that even the best of its representatives made all too great concessions to superstition in therapeutics and, in particular, that astrology drew more and more within its sphere of influence the whole of medical thought and action.

The *Astrologia Medica*, which owed its origin to Ptolemy and the Arabs, had developed into a highly complicated system which in the later Middle Ages despotically dominated prognosis and therapeutics. In accordance with the doctrine of correlation between macro- and micro-cosm the constitution, the cardinal humours, the parts of the body, the origin and course of diseases, remedies and their effects were brought into harmony with the seven planets (with which were reckoned sun and moon), or with the relative positions of the movable stars (conjunction, opposition, quadrature), and with the twelve signs of the Zodiac²; each of the latter governs a region of the human body: head and face are subject to Aries, neck and throat to Taurus, arms and hands to Gemini. Cancer dominates the chest, Leo the stomach and kidneys, Virgo the other viscera, Libra the spine and fundament, Scorpio the

¹ Thus the cephalic vein was opened in affections of the head; the median vein in anomalies of the heart and disturbances of the vital spirits as well as with the intention of producing a depletion of the organism as a whole; the basilic vein in abdominal complaints; the vena salvatella in splenic disease; the saphenous vein in pleurisy, affections of the kidneys, bladder and uterus; the popliteal for similar purposes and also to stimulate the menstrual flow, etc. In diseases of the head, eyes, etc., the cephalic vein was opened first, later the corresponding vessels of the head, "Venae particulares", in succession, in order to give the blood-stream a supposed other direction and thus directly to attack the local trouble.

² Saturn dominates the right ear, the spleen, bladder, fore-arm and skin; Jupiter, the lungs, liver and feet; Mars, the left ear, blood-vessels and sexual organs; the sun, the right side of the body, heart, etc.; Venus, the throat, abdomen and fleshy parts in general; Mercury, the arms, hands, shoulders and hips; the moon, the left side of the body, stomach, etc. The blood is under the control of Jupiter and Venus, black bile of Saturn, yellow bile of Mars, phlegm of the moon—Saturn causes protracted diseases, Jupiter short ones, Venus those of medium length, and the sun the shortest of all; Mercury variable and the moon remittent disorders. The sun and Mars give rise to diseases due to heat, Venus and Saturn those due to cold, Jupiter such as originate from plethora; Mercury is responsible for mental disorders, the moon for those of the nerves.

groins and sexual organs, Sagittarius the hips and thighs, Capricornus influences the knees, Aquarius the legs, whilst ankles and soles of feet are subject to Pisces. The extent to which diagnosis, prognosis and treatment were dependent upon the constellations cannot here be discussed in detail, but it may be mentioned that the moon undoubtedly played the most important part in the *Astrologia Medica* and that even the employment of emetics and purgatives, and especially the performance of venesection, were regulated according to sidereal laws.

In this connection it was above all held as an immutable principle that venesection was to be avoided when the moon stood in that sign of the Zodiac which governed the corresponding part of the body. Many MSS. contain corresponding illustrations, "Zodiacal men", with appropriate interdictions against venesection.

Many unexpected difficulties crop up in the path of the investigator who would understand mediæval pathological doctrines, not merely in their broad outlines but exhaustively, who would seek to penetrate more deeply into contemporary methods of treatment of any complicated case, since he enters into a wholly strange intellectual world rich in tradition, and of an incredible subtlety of thought. The difficulties which the modern reader has to encounter afford some measure of the demands made upon the literary knowledge, the intellectual grasp, the interpretative acuteness of the scientifically qualified physician, demands which could only be met by long and systematically applied intellectual enthusiasm. And in fact the medical educational system in the universities aimed at fostering erudition, and ensuring familiarity with logic, the most important part of the curriculum in addition to edition and commentation of the canonical books consisting of exercises in disputation—formal tournaments of speech. On the other hand, in boundless over-estimation of the "*Litera scripta*" and of abstract thought, in the belief that the authoritative literature was to be regarded as a completely closed, unassailable legal code, instruction in insight and original observation was neglected; it might indeed be said that the student, whilst receiving encouragement mentally to resolve external impressions and to interpret individual phenomena from the point of view of first principles, was not taught to analyse the real things, nor to learn from the world of experience. At most, outside the universities, which so far had not the least connection with hospitals, were some opportunities afforded through individual endeavour and private industry—halting and incomplete—to make use at the bedside, under expert tuition, of the guidance of the senses.

Teaching in anatomy and medical practice suffered most from the errors and perversities of the technical educational system.

Anatomy was chiefly recorded in books, to which later explanatory drawings and diagrams were added; dissections in no way formed the foundation, but only an occasional enlargement of the theoretical discussion, more ornamental than instructive. Dissections of animals (dogs and swine) still remained the most important means of practical instruction in anatomy, even after autopsies upon the human cadaver had been formally permitted, since all manner of restrictive official regulations had made the actual obtaining of subjects for study extremely difficult. Even in the favoured educational institutions of Italy, like Bologna and Padua,

it was with difficulty that, in accordance with the regulations, yearly a male and a female body could be dissected, and in universities outside Italy, where practical anatomy had already found a footing, *e.g.* in Vienna, many years often passed before opportunity for an autopsy¹ offered itself.

Such a course of anatomy (*anatomia publica*) always ranked as a sensational and quite exceptional event, in which in addition to doctors, surgeons and physicians, a widely-drawn circle of students took part, and frequently a non-medical public, composed of scholars and professional men, constituted the spectators. The autopsies took place mostly about Christmas or in Lent, lasted usually three to eight days, were performed in the open air, in an unused chapel, in a hospital room, a lecture-hall or some special building. It was not only the infrequency which minimised the value of the autopsy as a means of instruction, but still more the short time accorded, the haste and incompleteness of its performance, the crudity of its technique; it was not a question of actual dissection, of preparation of specimens, but rather of exenteration, undertaken with primitive instruments. The example of Mondino was followed, commencing by opening the abdomen, the layers of the wall, then the abdominal organs being described, exposed and demonstrated; thereupon followed, going from outside inwards, the anatomy of chest and head; the conclusion dealt with the "extrema", by which were understood all muscles, vessels, nerves and bones, which had received no consideration in dealing with the cavities, but the last and most important section seems in the course of investigation to have been dismissed in a few words or entirely to have been overlooked. Skeletons and supplementary preparations do not appear to have been made use of, or at least there is no record of them.

The fundamental error in anatomical instruction lay in the fact that theory and practice remained wholly divorced, that the performance of the autopsy and the scientific discussion were entrusted to different people. The book scholar who discussed the subject and gave directions had not the familiarity born of personal use of the knife, whilst the dissector on the other hand did not possess sufficient knowledge to understand the anatomical works. These lamentable conditions, which could only serve to perpetuate the ancient Galenic errors and to consolidate the authority of the Pergamene in anatomical matters, had their origin in the dislike of the mediæval physicians to all kinds of manual operations—a prejudice which served to keep the practice of surgery out of their hands.

Practical instruction at the bedside was not part of the university curriculum proper, and this was dependent upon the opportunities afforded by private instruction, although a supervising influence on the part of the medical caste was not wholly lacking. As pupil and assistant of experienced physicians the student of medicine had always opportunities to learn the art of healing in private practice or hospitals and to practise it independently under the guidance of his mentor after having acquired the necessary skill. That scholars were not lacking in zeal for this aspect of medical education, that indeed bounds had to be set to their endeavour to enter into practice at the earliest possible opportunity, partly on account of leanings towards quackery, partly on account of neglect of theoretical studies, is proved by the edicts which in many faculties became necessary with the lapse of time.²

¹ The baccalaureates and scholars in Vienna had indeed in 1435 passed a resolution to institute a yearly course of anatomy, but after the first in 1404 had taken place there is only proof of their occurrence in 1418, 1444, 1452, 1455, 1459, 1493, 1498, those proposed for 1441 and 1491 fell through because the condemned "subjects" intended for autopsy came to life again. The records show the circumstantial nature of the negotiations which the medical faculty had to undertake with the executioner, how they were carried on in secret, how a selection was made from the criminals concerned as though they were cattle. Many physicians must have left the school without having become familiar with the inner parts of the human body through their own observation.

² In Vienna the medical faculty in 1455 wished entirely to forbid visitation of the sick on the part of students, but were compelled under pressure in the same year to enact that such clinical work should be permitted to all those who had completed the third year of their course and who bound themselves to regular attendance upon lectures.

Opportunity to become familiar with drugs and methods of preparation of medicines—an important equipment for the practitioner of those days—was provided, not by the school, but only by the apothecary, since the university instruction consisted only of purely theoretical discourses or at most acquired a certain practical character by botanical illustrations.

Medical instruction thus bore an essentially theoretical stamp, and we may take as typical those old illustrations which represent the teacher—a bulky volume in front of him—holding forth *ex cathedra*, whilst attentive students sitting on benches or standing around listen or diligently take notes. The number of regular, salaried teachers (doctores, regentes, lectores ordinarii) was generally only a small one,¹ but they were assisted in the labours of their office by the other members of the faculty, and in a limited, well-defined degree by the “baccalaureates”. The discourses were based upon the writings of the ancients, of the Arabs and the Arabistic commentators, the treatment of the subject consisted in the teacher reading the book by sections, adding to the reading verbal explanations and elucidations of facts, discussion of vexed questions, illustrations from personal experience and finally a short epitome of the contents. A complement to the discussions was provided by the disputations held weekly in the presence of doctors; these were the touchstone of acquired knowledge, or rather of dialectic dexterity.

Tradition, the following of accepted precedents and statutory regulations, gradually established a settled routine in the course of study and the examination system, so that the individual medical schools at the close of the Middle Ages—in keeping with the prevailing pedagogic principles—were largely in agreement upon their curriculum and in their scientific requirements, without indeed attaining complete identity. As regards the choice of authors employed for instruction, the following appear frequently in the curricula of Arabic writings: the *Isagoge* of Johannitius, the 1st and 4th books of Avicenna’s “Canon” and the 9th book of Rhazes’ “*Liber medicinalis ad Almansorem*”. Of ancient writings: The “*Ars Parva*” of Galen, the “*Aphorisms*” of Hippocrates as well as the “*Prognostics*” and the book “*De diaeta in aentis*”. Pulse-lore and uroscopy were studied chiefly from the writings of Philaretus and Theophilus. Much use was made of a compendium which contained most of the above—the “*Articella*”.

Medical studies were preceded by preliminary education in languages, philosophy and natural science and occupied four to five years. The course was divided into two sections, the first of which ended with the baccalaureate, the second with the licentiate. To attain the baccalaureate it was necessary to have attended the medical discourses for two to three years and to have afforded proof in an examination before the members of the faculty of the possession of general theoretical knowledge in medicine, which was followed by a ceremony, the “*Determination*”, in which the scholar discussed a scientific question propounded to him. The admission to the licentiate, two to three years later, presupposed that the baccalaureate had diligently attended the prescribed course, had taken active part in the disputations, held discourses upon definite themes and also had been assiduous in his practical education; the examination held before the faculty consisted in the elucidation of a Hippocratic aphorism, the description of certain diseases and the answering of questions concerning them; following a successful examination the candidate was presented by two members to the Chancellor of the university, who ceremoniously conferred the licence upon him.

¹ The title “Professor” arose gradually, in German universities not before the sixteenth century. In the Italian civic universities the ordinary teachers were officially paid, in the academies under ecclesiastical control they obtained their income from clerical sources. It is in keeping with this that the teachers, at least outside Italy, should as a rule have been drawn from the clergy and should usually have been unmarried. In Paris the celibacy of the medical professors was not abolished until 1452, upon the reorganisation of the university by the Cardinal d’Estouteville, in Heidelberg only in 1482. In many places, however, the strict conditions were evaded, and benefices were secured to candidates not in a position to comply with all the requirements of the canonical law. The number of medical professors was smallest at the German universities, where there were only two, or at most three (one for “*theorica*” and one for “*practica*”).

The licentiate'ship carried with it the right to practise, but full privileges as a member of the medical faculty were only bestowed by the degree of doctor of medicine, which could be attained by every licentiate provided he was legitimately and honourably born, was not of unpleasing appearance,¹ and was at least 26 years of age.²

Bestowal of the doctor's degree did not entail undergoing another examination, only that the candidate should submit to the very expensive graduation ceremony (in church).³ The graduation was associated with a public disputation and various ceremonies, which were meant to typify reception into the medical faculty. The ceremony took place with bell-ringing, and was participated in by the entire faculty. It began with a dissertation by the candidate, the merits of which were extolled in a speech by the professor who supervised the proceedings. The candidate then subscribed an oath that he would at all times fulfil his duties towards the faculty and the medical profession as a whole. Hereupon the so-called doctor's cap (biretta) was placed on his head, and a ring on his finger as a sign of his knightly rank, with which the doctor's degree was considered equivalent, a golden girdle was clasped about his body, and a book of Hippocrates opened before him. He was then invited to take a seat beside the president, who embraced him and bestowed his blessing upon him. The ceremony closed with the thanks of the new doctor, and was followed by a banquet of which all the members of the faculty partook.

Literary facilities for a more extended education were on the whole lacking, since the production of manuscripts involved considerable expense. Private libraries, containing as many as twenty to thirty medical works, may for these times be considered important—the collection of Amphonius Ratinek (consisting of 635 MSS.) was a unique phenomenon.⁴

The learned mediæval physician, indeed, in consonance with his entire education, was *de facto* familiar with internal medicine alone, all manual operations being relegated—out of professional prejudice—to a socially inferior caste, although, presuming upon his supposedly superior book-knowledge, he laid claim to an authoritative position in surgery and its affiliated branches. This sovereignty, so ostentatiously paraded, existed more in imagination than in reality, and it assumes its real value when the medical conditions, the professional circumstances of the epoch are considered.

In general the physicians belonging to the clergy abstained from surgery in obedience to repeated ecclesiastical prohibitions, and their example was followed by the medical laity,

¹ Repellent ugliness, disfigurement through obvious bodily deformity excluded the candidate from promotion because it was feared that pregnant women would otherwise be alarmed at him.

² In many faculties the age was laid down as 28, exception being only made to this rule when the candidate's appearance was not too feminine or youthful.

³ In Paris and Montpellier in particular, where the traditional usages were distinguished by exceptional formality, the expenses of the doctor's degree through the outlay demanded of the candidates in the shape of taxes, presents and bribes were exceedingly high. In Vienna it was the duty of the candidate to present to one doctor at least 14 ells of good cloth for a suit, to each of the other doctors a cap and a pair of embroidered gloves, to each licentiate and baccalaureate a pair of ordinary gloves, to the beadle a robe suited to his office or two florins to spend, etc. Poor candidates, if they distinguished themselves by their knowledge, were as an exception excused their high fees.

⁴ The medical faculty of Paris in the year 1395 possessed no more than nine works, of which the most treasured was the "Continens" of Rhazes. When Louis XI., in 1471, wished to borrow this in order to have it copied, he only obtained permission upon depositing a guarantee of 12 marks in silver and advancing 100 florins in gold. In the year 1465 the Parisian faculty only possessed twelve works.

since it was held unseemly that a man who had studied Aristotle and Galen should demean himself by manual labour and enter into competition with surgical empirics. "*Inhonestum magistrum in medicina manu operari.*" There were, indeed, exceptions in France and Italy, but even there the number of physicians educated in both branches was always an exceedingly small one. Surgery was indeed taught from books in the universities, but to obtain any practical education in it lay beyond the scope of the curriculum, particularly outside Italy. The baccalaureates of the medical faculty of Paris from 1350 onwards had to undertake—under penalty of expulsion—to practise no manual surgery, a precedent which was followed by other schools. Nevertheless the physicians presumed to dictate to the surgeons, demanding that the latter should do no more than carry out the directions given them, a position energetically combated by Henri de Mondeville and Guy de Chauliac. In actual fact the surgeons submitted to no limitation of independent practice of their art.

The physicians took up an incomparably more detached attitude towards obstetrics than towards surgery, a result, not only of contemporary professional ethics, but also of the dislike on the part of women to the presence of male physicians in the lying-in room. Obstetric medicine was almost wholly the affair of midwives, whose knowledge was of the most primitive order, hardly indeed going beyond traditional superstition;¹ a male attendant came on the scene at most in cases where the removal of a dead foetus or a retained placenta had to be undertaken. The principal medical works, therefore, apart from occasional mention of post-mortem Cæsarean section, contain, as a rule, only the chapters "*de extractione secundinae*" and "*de extractione foetus mortui*", and the subjects exceptionally discussed by some authors (care of perineum, version, extraction or reposition of arms, etc.) were doubtless to be looked upon more as the fruit of reading than the outcome of personal experience. The pictures of foetal positions which adorn many MSS. are most probably derived from very ancient (? Alexandrian) sources. Only about the middle of the fifteenth century did the physicians begin to come into closer touch with obstetrics (at least as far as the upper circles are concerned), but at first only from the point of view of pure physicians. Gynæcology (abnormalities of position of uterus, dysmenorrhœa, sterility, hysteria) is treated rather more exhaustively by the more eminent authors, following the ancients.

Ophthalmological literature is very scantily represented—exclusively from the point of view of dietetics and medicinal treatment—since ophthalmological practice was undertaken by surgeons and still more by peripatetic empirics.

Physicians brought up in scientific traditions and hailing from the universities form part of the picture representing the conditions of later mediæval medicine, the most distinguished element, if numerically weak. It was not only that, within the sphere of action of the legitimate representatives of science, all manual and operative measures were entrusted to the so-called surgeons, to barbers, bath-attendants and midwives, whereby eminently important branches of the healing art were actually monopolised by these, but that medical practice as a whole, the more so as the neighbourhood of the larger towns was left behind, and the distance northwards from Italy became greater, lay in the hands of incompletely, only manually trained healers, or even of unscrupulous adventurers or peripatetic quacks.

¹ They obtained their education as "girl-apprentices" under older midwives; for long their capacity was estimated only by public opinion, represented in this case by the most highly esteemed women of the district. These held a species of examination. It was not until the end of the Middle Ages that real examinations were instituted, undertaken by the municipal physicians. From the middle of the fifteenth century onwards municipal midwives were appointed who were subject to definite regulations.

The students of medicine were everywhere numerically inferior to those of the other faculties. The medical doctor's degree was also the most expensive. Nowhere did the number of graduated physicians bear even a remotely approximate relationship to the population,¹ least of all in the German-speaking countries. Their social position was a high one;² the important rôle played by them and their art in social life is distinctly indicated in polite literature;³ whether in the form of praise or blame, tradition bears witness to the favourable pecuniary position occupied by individual members of the profession. Whilst from the thirteenth century onwards educated lay as well as clerical physicians were to be found elsewhere than in Italy, after the fourteenth century the former preponderated, in keeping with the flourishing urban civilisation.

It was only in Italy and France that the necessary conditions existed for the education of surgeons, in the strict sense of the word. In Italy, where in consequence of the more secular spirit of the universities the technical distinction between physicians and surgeons had not led to a sharp social partition, the celebrated schools did not think it beneath them to provide thorough theoretical training to pupils in surgery; practical efficiency could only be obtained by means of private tuition at the hands of a capable master. Colleges existing in the larger towns, like the *Collegio de' Medici Chirurghi* in Venice, and the medical faculties elsewhere, were empowered to keep watch that no one practised surgery without previously having passed an examination. In France, there were surgeons of the better sort in many of the larger towns, but these never enjoyed a social position in any way comparable with that of the physicians. In Paris the "Confrères de St-Côme et St-Damien" constituted, in accordance with a royal edict of the year 1311, the authority with whom rested the power of granting the "licentia operandi" subsequent to examinations successfully undertaken. From the statutes of the school, later connected with the College, it appears that its pupils had to produce evidence of preliminary education in the arts and had, in the course of a two years' study with frequent examinations, to acquire a fairly comprehensive technical knowledge.

The requirements of a regular, scholastic, surgical course of study were, however, not complied with by many, since on the one hand, as will be presently shown, members of other professions with merely manual training were permitted the practice of minor surgery, and, on the other, the danger attending many major operations brought with it the worst and most terrifying consequences to the honourable and well-grounded surgeon in case of mishap. Thus the latter left operation for hernia, stone and cataract for the most part to such empirics as, moving from place to place, could readily evade responsibility, or indeed were possessed of a specialised dexterity worthy of recognition, although they more often substituted boldness and unscrupulousness for knowledge. The surgeons had a harder fight for existence against the barbers (*barbitonsores*) and bath-attendants (*balneatores*) than against these suddenly arising and equally suddenly disappearing adventurers, for the former were not content with permission to undertake surgical functions, in addition to their proper trade, but were constantly striving to obtain additional legal rights, and herein unfortunately obtained support from the medical faculties (from dislike to the surgeons) as well as from rulers and officials. The barbers were entitled to perform venesection, cupping, tooth-extraction, to treat fractures and dislocations, ulcers and fresh wounds; the bath-attendants were permitted venesection, cupping and the treatment of old injuries only within their own dwellings, outside them, the reposition of fractures and dislocations. Naturally the bath-attendants frequently overstepped their legitimate boundaries at the expense of the barbers, just as the latter encroached

¹ Thus, for instance, the Parisian faculty in 1292 numbered only 6 members, and no more than 32 in 1395, which gave a proportion of 1 doctor to 8500 people in Paris of that time.

² Socially they were included in the ranks of the nobility. Promoted body- or municipal physicians stood on an equality with knights. Amongst the privileges enjoyed by municipal physicians were included exemption from civic taxes, freedom from watch- and military services, etc. The physicians were exempt from the usually stringent sumptuary laws, hence many sought by ostentation to impress the multitude.

³ Chaucer's *Canterbury Tales*, v. 413-416.

upon the domain of the surgeons proper, proceedings which led to frequent and long-drawn disputes. In such towns as possessed surgical colleges the barbers were at first compelled, in order to obtain permission for restricted surgical practice, to undergo preliminary examination at the hands of the masters of surgery;¹ later, however, the right of examination was as a rule accorded to the masters of the barbers' guild themselves,² which they already possessed in places where they exercised sole sway. Whilst in France the dividing line between barbers and surgeons was in most places done away with through the extension of the licence, the boundary was hardly to be drawn in other countries, either because there was an early amalgamation³ between the corporations (barber-surgeons), as *e.g.* in the Low Countries, or because no well-defined distinction had yet been drawn between them and the legitimate representatives of surgery. Particularly was this the case in Germany, where there were only manually trained surgeons⁴ who, in addition to bath-attendants and barbers, but not clearly distinguished from these, practised surgery. To the privileged surgical practitioners belonged also exceptionally the executioners who were particularly privileged to treat dislocations.⁵ The unqualified surgeons also dealt with the treatment of eye and ear affections, skin and venereal disease; they intervened, though rarely, in difficult obstetric cases; they rendered great service in times of plague; they were employed in forensic and hygienic capacities and were everywhere indispensable for carrying out important therapeutic directions (venesection, cupping, etc.)—can it be wondered at, therefore, that in the public estimation they took rank as the real representatives of the art of healing, as “masters”, the more so since, up to the thirteenth century, they were almost the only lay members of the medical profession, and even in later times, partly from lack of physicians, partly from pecuniary reasons, their assistance alone could be counted on by considerable sections of the population? That under such conditions they should frequently have encroached upon the domain of the scientifically educated physician, upon legitimate practice, must indeed be designated as culpable quackery, but in addition to greed of gain the nature of the case and the confiding trust of the public may have been contributory causes to this end.

The midwives also did not strictly confine themselves to their profession, but extended their activity to gynaecology and pediatrics—branches that they had at all times considered as their own, going even further into competition with the physicians upon other subjects; the frequently mentioned “woman-doctors” (*medicae*) having probably belonged to this caste.⁶

¹ *E.g.* in Paris, where the barbers, after undergoing examination before the “*Maitres en Chirurgie*”, bore the title “*Barbiers-Chirurgiens*” or “*Chirurgiens de courte robe*”. After 1474, also in Venice, where the barbers were obliged to call in the surgeons in cases where life was in danger.

² *E.g.* in Paris as early as 1371, with a simultaneous considerable enlargement of the licence, the underlying motive of which was that, on account of the high fees, only people of quality, not the populace, were in a position to consult the surgeon.

³ In England there were in existence a “*Guild of Surgeons*” and a “*Guild of Barber-Surgeons*”. The members of the latter were forbidden to undertake the treatment of persons in mortal danger.

⁴ In the examination which followed the course of study, apart from answers to a series of questions, the preparation of various salves, vulnerary potions and plasters, the application of various dressings, perhaps the performance even of minor operations were required. The barber had a surgery and upon occasion even received patients into his house. The honorarium was regulated by a scale of prices.

⁵ They reduced dislocations produced upon prisoners put to torture on the rack, but this assistance was often demanded upon other occasions also.

⁶ Apart from the conditions obtaining in Salerno, it appears that, as scientific medicine gained ground, women were excluded from medical practice and confined to the care of the sick and domestic medicine. An edict of Paris in 1311, however, accorded permission to women, following an examination before the *Confrérie de St. Côme*, to practise surgery, and municipal archives afford evidence of the existence here and there even in later centuries of respected woman-doctors, particularly eye-specialists, as well as phlebotomists, but in the overwhelming majority of cases

The apothecaries also frequently took upon themselves the rôle of physicians, to whom were to be added monks, ecclesiastics, Jews and even herds, shepherds, smiths, etc., as unfavourable representatives of the medical profession. The most numerous contingent of the huge army of charlatans of both sexes, however, was furnished by the peripatetics so common in the Middle Ages who travelled about as herniotomists, lithotomists, cataract extractors, tooth-extractors, alchemists, etc., clad in grotesque garments, appearing particularly at the yearly markets and thoroughly understanding the art of attracting the credulous inhabitants by loud outcry and all manner of buffoonery and thus disposing of their arcana.

Qualified physicians practised their art as court-physicians or municipal physicians, later also, in proportion to their increase, as independent practitioners. A long period of evolution was required, however, especially in the Germanic countries, before even the larger towns had in their service "Masters" or Doctors of medicine in place of or in addition to vulgar surgeons. As military surgeons the surgical empirics (Barbers) naturally remained long in the foreground.

The municipal physicians, like the court-physicians, received their salary in cash and in kind, in addition to which they enjoyed various privileges. Upon the municipal physicians lay the obligation of gratuitous attendance upon the poor and in the civic institutions, care of hospitals, inspection of pharmacies, visitation of lepers, legal expert advice, later also examination of vulgar surgeons, apothecaries and midwives. Upon occasion they had also to accompany the civic militia in the field.

Care of the wounded in war was throughout the Middle Ages lamentably neglected. We do indeed read that physicians and surgeons (mostly barbers) were to be found in the train of kings and nobles—but the soldiers of the improvised armies only benefited casually from any assistance, the earliest being provided by the barbers, who were to be found in camp along with merchants, smiths, etc. Faint traces of an organised service are first found in the civic militias (of Italian, later of French and Flemish cities), later amongst the mercenaries whose leaders sometimes themselves provided surgeons.

In Italy there were special physicians for the fleet and for the embassies; in Florence they were even appointed for prisoners.

An important part in the lay branch of medicine was played in all countries by the Jewish physicians, whose rôle in the history of the mediæval healing art was a very important one. Many of them stood upon an equality with their Christian colleagues from the point of view of culture, some of them indeed—if the unusual favour of princes and of many popes or the popular voice may be taken as an indication—were above the average. It was almost exclusively in Italian universities that they were enabled to pursue their regular course of studies and obtain the highest academic degrees, since the other academies of the later Middle Ages shut their gates more and more to eager students of Jewish race, or from the first did not open them. Where, owing to the limitations imposed by the confessional, they were not in

women who gave themselves up to the treatment of internal or external diseases, and who even followed armies on their campaigns, were to be classed as charlatans and enjoyed no good reputation, especially as not a few practised in addition many doubtful trades.

a position to comply with the formal requirements of the licence, the Jewish physicians ranked, indeed, in the eyes of the medical fraternity as illegitimate practitioners, despite the fact that they often acquired by devious means very considerable knowledge and capacity. It must, nevertheless, not be denied that the Jews, particularly in Germany, where their cultural level was much lower than in the Latin countries on account of their heavy oppression, furnished a strong contingent of real charlatans.

In the foregoing paragraphs incidental mention was made of the fact that the Jewish physicians in the early Middle Ages were almost the only educated practitioners amongst the laity and maintained this position in the less civilised countries as late as the thirteenth century; further, that they stood in close relationship with the school of Salerno and even more so with that of Montpellier; finally, that to their credit stands the transplantation of Arabic medicine to the West, notably by means of translations. It may be added that, with all respect for the ancient and Arabic masters, they brought the keenest interest to bear upon the literary activity of the West and did not rest content until the most valuable of the Salernitan and later mediæval authors had become the intellectual property of the nation by translation into Hebrew.

The comparatively large number of mediæval Jewish physicians, who in Italy, Southern France (Provence) and Northern Spain stood on a high level is—apart from an almost traditional predilection for the art of medicine¹—explicable by the fact that the Jews were debarred from all other learned callings; also, as may readily be understood, capacity in the domain of medicine was the earliest means whereby the insupportable burden which oppressed the proscribed race might, for individuals at least, be lightened. They obtained their education partly in the Jewish schools and through private tuition, partly at the universities, which were, however, accessible to them only in a very limited degree and in which, owing to their prevailing clerical character, they could only very rarely obtain the doctor's degree.

If they bore a title at all it was therefore generally that of "Magister". In their practice they were by no means restricted to their compatriots, but were rather held in high esteem by Christians in all countries, not by the common people only, but still more by the highest ranks, even by clerics; we find them as body-physicians to Popes, ecclesiastical and temporal princes, or in municipal offices, but chiefly, however, as independent practitioners. In many places, as *e.g.* in Avignon, they monopolised the entire practice. One circumstance told greatly in their favour, *viz.* that in contrast with the legitimate practitioners, they frequently devoted themselves to surgery; many indeed designated themselves as *vulnerary* or *ophthalmic surgeons*.² The popularity that the Jewish physicians enjoyed with their patients was

¹ The Mosaic law, with its admirable hygienic directions, raised the care of health to the level of a religious duty; study of the Talmud made the discussion of medical questions frequently necessary and handed down from antiquity a mass of technical knowledge. Upon this basis, but always aiming where possible at the furtherance of knowledge by bringing it into relation with contemporary progress, the Jews practised as successful physicians in Byzantium and Persia amongst the Arabs, and finally, amongst the Western nations of the Middle Ages, everywhere transplanting traditions, everywhere absorbing fresh knowledge. In earlier times the Rabbis in the Jewish communities pursued the practice of medicine, the more so in that, being unsalaried, they were by this means enabled honourably to earn a livelihood.

² In many Jewish families the practice of ophthalmology (based upon Hispano-Arabic tradition) was handed down from father to son. The library of Besançon possesses an ophthalmic compendium in MS. of the fourteenth century, which had been in the possession of Jewish oculists, as may be gathered from Hebrew annotations. It may, too, be mentioned that Jewesses also practised medicine, and many of them, particularly in ophthalmology, enjoyed a great reputation.

evidenced by many privileges which certain of them received at the hands of popes, rulers and civic authorities. This is the more remarkable in that the Church from the thirteenth century onwards repeatedly issued stringent commands to Christians to avoid Jewish physicians,¹ and the medical faculties were by no means wanting in ill-will towards practitioners without the pale.

The increasingly important position of scientific medicine and physicians in the State, the growing demands made upon them, gave rise gradually in other lands, particularly in Germany, to the establishment of medical regulations, which defined the rights and duties of the latter. In this respect must be mentioned the Nürnberg medical edict of 1350 and that promulgated by Charles IV. for Silesia.

This official recognition of the medical professional class did not, however, go so far as to concede for the representatives of the medical art their due position as experts in the eyes of the law, or to ensure them a deciding voice in debating and carrying out arrangements touching the public health. As regards the latter, there were not wanting, particularly in the later Middle Ages, well-intentioned endeavours towards removal of unfavourable hygienic conditions and earnest attempts at prevention of epidemics; the institution of quarantine dates back to the fourteenth century.

The general hygienic conditions of the mediæval towns, with their dense populations, their architecture, excluding both light and air, their narrow streets, their defective drainage, bad water-supply, unhygienic burial system, etc., were the most unfavourable possible; if, in addition, one calls to mind the dangers accompanying the active mercantile and pilgrim intercourse, the beggar nuisance, the drunkenness and sexual excess, the universally prevalent dirt, etc., it will not appear surprising that epidemics and endemics of every kind, for the origin and propagation of which the most multifarious conditions were present, claimed hecatombs of human lives, the more so since the prophylactic measures occasionally undertaken lacked for the most part any adequate scientific and technical foundation.²

¹ The alleged motive underlying the edict was that mediæval physicians had the duty laid upon them of insisting that those dangerously ill should receive the sacrament, an obligation less binding upon Jewish physicians than upon others; it is comprehensible, therefore, that popes and bishops should frequently have employed Jewish body-physicians whilst forbidding such to the faithful. The Church admitted an exception in cases "*cum nullus alius medicus adest, vel cum est excellens alius medicus in Judæis*".

² Individual hygiene stood upon a much higher plane than the care of the public health, being chiefly based upon the prescriptions of the *Regimen Salernitanum*. It included, not only dietetics in the narrow sense, but also a series of strictly regulated prophylactic measures—bathing, cupping and venesection, taking purgatives at stated times. The balneology (warm-water baths, diaphoretic baths, herb-baths, etc.) of the Middle Ages was very complicated, even if the technical appliances could not compare with those of the Roman era. In the later Middle Ages every community possessed one, larger places several, public bathing establishments with steam and ordinary baths; in order that the poor might not be deprived of the benefits of bathing, pious foundations took the burden of expense upon themselves. The service was provided by bath attendants of both sexes. When the bath was available—the institution was in full use only upon certain days of the week—the fact was announced by outcry, horn-blowing, etc.; particularly in the evenings before holidays and Sundays the populace streamed to the bathing establishment. Baths grew so much in the esteem of the public that they took a foremost place amongst social delectations; but unfortunately many public baths early degenerated into meeting-places conducing to idleness and dissipation, into

The most important of the official preventive measures were those taken against leprosy and the plague.

Regarding the lepers, it has already been mentioned above that the State, even in early times, insisted upon the exclusion of these unfortunate patients from the civic community and that, in order to counteract the disadvantages of unregulated isolation of the leprosy, a large number of special leper-houses were established, the upkeep of which was defrayed by public and private donations and bequests. The lepers lived there under a "master" chosen by them from their midst in a species of association with monastic forms. On certain days they were permitted to come into the towns in order to beg and obtain their necessities of life. They were obliged to wear a prescribed dress,¹ easily recognisable from afar, to carry a rattle wherewith to give warning upon the approach of any man; objects which they wished to buy they might only touch with their staff and they were forbidden (except under stress of most urgent need, and then only with the observance of certain precautionary measures) to speak with any save their fellows, to drink from public fountains, or to visit churches or inns. The decision as to who was to be considered leprosy was in the later Middle Ages for excellent reasons no longer as before left to a single individual (*e.g.* the master of a leper-house), but was made over to a commission constituted of physicians as well as the laity.² The diagnosis was for the most part based upon genuine manifestations of the disease, but also upon many fantastic methods of investigation.³

haunts of immorality (mixed bathing, service by "maidens"). The Jews had their own bathing-places and use of others was forbidden them. In close relationship with the bath system stood venesection and cupping as hygienic rules against excess, as preventive measures against disease; these are traceable to monastic customs. Four to six prophylactic venesections were usually undertaken annually; definite rules were in existence governing the times of their performance according to the prevailing astrological system. The psychological moment was indicated on the part of bath-attendants and barbers by hanging up a venesection bandage. As an alternative cupping took the place of venesection. The periodic taking of purgatives, to a less extent the employment of enemata, for prophylactic purposes, played an important part. Monthly medical rules for bleeding, cupping, baths, drug-taking, choice of meat and drink according to the Salernitan pattern, not only form part of the contents of popular formularies and dietetic treatises, but in order to attain the widest circulation were incorporated in the calendars. Life "according to rule" had become a universal custom.

¹ The so-called Lazarus-robe was a black dress with various badges, in addition to which were worn a hat with a broad white band and gloves. On the breast of the garment or on the hat were usually sewn two white woollen hands—as a sign that the hand of the Lord rested heavily on the outcast.

² The decision was an unusually momentous one, since the leper was deprived of his rights as a citizen and from then onwards was reckoned civically dead. The declaration of leprosy was in many places accompanied by a religious burial service (a requiem with all appropriate rites), upon the termination of which a spadeful of earth was thrown upon the feet of the unfortunate. On the other hand members of the lowest social strata occasionally attempted to join the lepers in order to beg unhindered. The lawlessness in the leper-houses frequently reached a high degree, even to the extent of a formal revolt of lepers against citizens. At the time of Philippe le Bel of France the lepers were accused of conspiring with the Jews to poison the water-supply.

³ Many excellent descriptions of leprosy are found in the mediæval medical authors, and the diagnostic insight of the physicians in this respect was undoubtedly much sharpened by frequent observation. In spite of preconceived humoral theories (black bile as cause of leprosy), which did not, however, stand in the way of the foundation of a rational basis for the ætiology of leprosy (contagiousness, heredity, fish-diet, etc.), considerable attention was paid to symptoms. The most reliable signs enumerated are: falling of the eyebrows, thickening around the orbits, exophthalmos, swelling of the nose, livid complexion, fixed stare, nodules on face and ears, white spots (*morphoea alba*), dark spots (*m. nigra*), atrophy of the muscles between thumb and forefinger, a tense, shiny condition of the skin of the forehead, anæsthesia of the outer surfaces of the tibiae and little toes. Amongst the diagnostic methods were the following: examination of cutaneous sensibility in the neighbourhood of the tibiae and tendo Achillis—positive result in cases of per-

Doubtless diseases of different origin were frequently confused with leprosy.

Energetic official measures combating the plague, which even after the disappearance of the "Black Death" constituted a standing menace, are first met with in the last decades of the fourteenth century, as the conception of the contagious nature of the visitation became more and more widely accepted. Italian towns and harbours on the Mediterranean, which through their active commercial intercourse with the East were particularly exposed to plague infection, were the first places to make use of segregation as the most effectual preventive measure, of detention of suspected travellers in quarantine stations, of strict isolation of plague patients and of a sort of sterilisation of objects exposed to infection. The example given was gradually followed by inland towns with publication or more stringent application of corresponding hygienic enactments.¹ The physicians were certainly interrogated by the officials upon the nature of the evil and the methods of treating it, but never, or rarely, as to measures by which it might be prevented.

Least of all, or more correctly, not at all, did the physician play a part in the care of the insane, since protection of the community against persons dangerous to the public welfare was the only thing thought of, care of the insane as such being quite an exception.

In relation to the treatment meted out to sufferers from mental disorders, the mediæval West stands in sharp contrast with antiquity and particularly with Arabic civilisation (cf.

manent anæsthesia and exudation of serous instead of sanious fluid; moistening the skin of the patient with water or dusting it over with salt—positive if the latter, but not the former, adhered; exposure to cold air—positive if no goose-flesh resulted; examination of the blood—positive if it be black or ashen, if, when treated with water and washed, it left fine threads behind, a sandy, granular, coagulated "flesh", if salt rapidly dissolved in it, if it mixed quickly with vinegar and water; urinary examination—positive if the urine contained a fine white or grey deposit.

¹ Apart from Genoa and Milan, where quarantine was practised at the time of the Black Death, Venice was the first town where, in 1374, regulations were enforced against the introduction of the pestilence. In this year the Visconte Bernabo of Reggio (near Modena) enacted that whoever was attacked by the plague should leave his habitation and betake himself to open country or forest; that any one who introduced the disease should lose his entire property; that whosoever had cared for plague patients should remain apart for ten days, avoid all intercourse with healthy people, and further, that no one except those specially set apart for that purpose should associate with plague patients. These enactments were added to in 1399 by the Visconte Giovanni (guarding the city gates as in war-time in order to prevent entrance of strangers suspected of plague; ventilation and fumigation of pest-houses for eight to ten days; burning of rubbish, straw, rags, etc.). In Ragusa, in 1377, the magistrates ordered that all travellers from plague-stricken localities should be warned away from the district, unless they had previously made a stay of one month in Mercana or Old Ragusa by way of isolation. Those who had come into contact with the isolated had also to spend a month apart and be purified by sun and air. The thirty days' segregation, or trentina, was first extended in Marseilles to quarantine. At the quarantine stations established there in 1383, passengers and goods from pest-stricken ships or from those under suspicion were isolated for forty days and exposed to wind and sun. In 1402, in Milan was initiated the system of purifying plague-infected objects by means of fumigation. Venice also, in 1403, established a quarantine lazaretto. These examples were followed during the fifteenth century by other seaport towns. As early as 1471 Majorca possessed a completely equipped plague quarantine, the management of which was in the hands of Lucian Colomines. Venice, in 1485, set apart a special sanitary official as plague authority. In various towns of Germany and Austria during the fifteenth century the measures taken during plague epidemics were made considerably more strict, whereby attention was drawn to the different ways in which the pestilence was spread. Plague patients were accommodated in empty lazarettos or newly-built hospitals, asylums and quarantine stations were established; large assemblies were forbidden; public baths were closed; strict enactments were issued against pestilence-spreading vagrants; keeping of dogs, cats and birds in the house was forbidden; improved scavenging was provided for, etc.

Vol. I. p. 378); this is dependent upon the view prevailing at that time, and unfortunately for long afterwards, that the lunatic was not a patient, but one possessed of an evil spirit.

The well-disposed insane were allowed complete liberty, or upon occasion, if they did not cause too much disturbance, they were received into hospitals, which in many cases contained separate insane wards. Troublesome lunatics, on the other hand, were, if the exorcisms employed remained without effect, put in chains and immured in prisons or special places of confinement. The attendance was in the hands of rough jailers. Strange lunatics were, if troublesome, simply driven forth by the public executioner; in order to prevent their returning they were well whipped before their departure. Only where Occidental Christian civilisation was in direct touch with Arabic, in Spain, were there in the later Middle Ages real institutions for mental disorders, conducted upon humane lines, the foundation of which lay largely to the credit of the order "*della mercedes*". The first great lunatic asylum in the better sense of the word was opened in Valencia in the year 1409, to which were added those of Saragossa (1425), Seville (1436), Toledo (1483).

The chief sphere of activity for the medical calling was to be found in private practice—a circumstance little favourable to medical research. Even when dealing with hospital patients, however, the physician was hampered in his labours by closely drawn restrictions of every kind. Mediæval hospitals indeed (with their primitive organisation) were rather nurseries of epidemics than real infirmaries for the sick, the physician had no voice in their management, the fact being that medical treatment by no means played the most important part within their walls.

It is amongst the characteristic features of mediæval Christian civilisation that the philanthropic care of the sick inspired by ecclesiastical piety easily took precedence of strictly medical therapy.

Care of the sick as part and parcel of Christian philanthropy and social care form a notable chapter in the history of the Middle Ages, even though devout selfishness, seeking personal salvation, was, for the most part, the impelling motive. Clerics, monks and laymen, members of the highest and lowest social grades, met upon this field of endeavour in praiseworthy competition. Among those who occupied themselves in the later Middle Ages with the care of the sick stand out most prominently the Beghards, Lollards and Beguines, the Brotherhood of the Kalends (notably as fearless attendants upon plague patients), the Antonites, and Alexians or Cellites (from *cella*, the grave, since they also served as buriers of the dead).

Popular medicine was to some extent countenanced and encouraged by philanthropy, having been restricted in its scope by the advance in scientific healing, but by no means entirely done away with. No strict division in principle between scientific and popular therapy had so far been evolved; interchange between them was of frequent occurrence; just as educated physicians accepted many empirical or even superstitious customs, so did scientific medicine undergo many changes by the assimilation of foreign drugs. In popular medicine a belief in the efficacy of certain incantations and benedictions, of certain mystical procedures, was indissolubly bound up with natural processes of cure.

Bearing in mind the debt which misfortune owed to hope and imagina-

tion, with a clear understanding of the many failures of contemporary medical art, it will cause no surprise that medical superstition, in spite of advancing civilisation, took immense strides instead of diminishing—particularly at the times of fearful pestilence, which demonstrated in terrifying fashion the impotence of human endeavour.

Scientific medicine had many worlds to conquer. First and foremost, with the incompleted tasks before it to which its hand was set, it stood in need of a far-reaching revival, which should permeate the very core of its being.

This task was beyond the strength of mediæval medical art, which indeed threatened, under the influence of increasing systematisation of knowledge, to fall under the spell of that petrification which was so eminently characteristic of the Oriental nations. Occidental medicine was fortunately saved from this fate by potent extrinsic factors—those indeed which laid the foundation of modern civilisation.

As for the intellectual life of the West as a whole, so also for medicine did an ever-memorable, illuminating transition period set in in the second half of the fifteenth century, an epoch notable through its achievements, but even more so through those for which it paved the way.

HISTORICAL SURVEY OF LITERATURE

FOURTEENTH CENTURY AUTHORS

ITALY

FRANCISCUS DE PEDEMONTIUM (Francesco di Piedimonte), born in San Germano in the Terra di Lavoro, probably a Salernitan student, body-physician to King Robert and a professor in Naples (d. ca. 1320), was the author of one of the best mediæval handbooks upon special pathology and therapeutics, in which the union between Salernitan and Arabic medicine is plainly visible, without too prominent a place being accorded to scholastic arguments. This was the "*Supplementum Mesuæ*", a complement to the latter's "*Practica medicinarum particularium s. liber de appropriatis*", corresponding with lib. ii. of the *Grabadin* (cf. Vol. I. p. 393), which continues where Peter of Abano left off (cf. p. 77), i.e. with the diseases of the heart, intestines, liver, uterus and joints. The work is predominantly of the nature of a compilation (an imposing array of authors is mentioned, ancient, Byzantine, Arabic, Salernitan and later), but there is little in the way of original observation, but rather a mass of formulæ (many recommended as "*ex inventione nostra*"). The greatest interest attaches to the obstetric section. An important recommendation is that the midwife should not anticipate nature in normal deliveries, she should only keep watch and guard against contingent dangers. Amongst methods of assisting delivery are included posture, fumigations, lubrication, sternalutories, instrumental dilatation of the os uteri, puncture of membranes. In complete footling presentation, if the arms are not in apposition to the thighs, they are to be brought down; in partial foot and transverse presentation cephalic version is to be attempted; if this proceeding is fruitless the second foot is to be brought down and extraction performed, delivery being effected as with a dead child. In still-birth, drugs are first to be employed; if these fail, extraction with hooks and dismemberment. In delivery of the placenta only medicinal means are to be employed. In addition to rational measures, superstitions play an important part.

MATTHÆUS SYLVATICUS, "the Pandect of Mantua" (d. 1342), dedicated to King Robert of Naples his subsequently celebrated "*Pandectæ medicinæ*", a *materia medica*, dealing with the science of synonyms, in some 720 articles; the etymological explanations may well not be the work of the author himself. Matthæus Sylvaticus compiled his work from a large number of authors, whom he quotes, and doubtless undertook extensive travels in the interests of his work. In his later life he lived as "*miles et physicus regius*" in Salerno, where he cultivated a botanic garden.

SCHOOL OF BOLOGNA

GUILIELMUS BRIXIENSIS (Guglielmo da Brescia, 1250–1336), from Canneto, near Brescia, was first teacher of logic in Padua, then studied medicine in Bologna under Taddeo Alderotti, from whom he received his degree, and was later body-physician to the Popes Boniface VIII., Clement V. and John XXII. (in Avignon), who heaped rewards upon him; at the end of his life he returned to Paris. His "*Practica ad unamquamque egritudinum a capite ad pedes*", commonly known as "*Aggregator Brixiensis*", acquired great popularity. This was a compilation permeated with a scholarly spirit and epitomising in its various chapters upon

special pathology and therapeutics the views of the most representative authors, without aspiring to any independent criticism.

BARTOLOMAEUS VARIGNANA (d. ca. 1320), a pupil of Taddaeus Florentinus, an eminent physician and celebrated teacher, who also took a prominent part in political life. Only a few specimens of his writings were printed.

GUILIELMUS VARIGNANA (d. ca. 1330), son of the former. His writings were collected in the "*Opera medica de curandis morbis universalibus et particularibus, febribus, venenis, faciei et totius corporis mundificationibus*". G. de Varignana was one of the first to insist upon the isolation of plague patients.

DINUS DE GARBO (Dino or Aldrobaldino del Garbo, Dinus de Florentia), born in Florence, the son of the surgeon Buono or Bruno, pupil of Thaddaeus, was a respected teacher in Bologna, temporarily also in Siena and Padua, and enjoyed the particular favour of King Robert of Sicily, the Maecenas of all scholars. He died in his native city in 1327. Dino, one of the most cultivated and eminent physicians in the eyes of his contemporaries, showed himself a blind adherent of tradition (*secutus est Galenum sicut Evangelium*), his somewhat more liberal-minded son says of him). Of his writings the following have been printed: *Chirurgia cum tractatu ejusdem de ponderibus et mensuris nec non de emplastris et unguentis*, mainly derived from Avicenna; *Expositio super Canones generales de virtutibus medicamentorum simplicium secundi Canonis Avicennae*—from this work he derived his nickname of "*Expositor*"; *Recolleones in Hippocratis librum de natura foetus*; *Enarrationes in Guidonem de Cavaleantibus de natura veneris amoris*; *De coena et prandio*. Dinus de Garbo was, moreover, accused of having plagiarised the works of his contemporary Turisanus.

THOM. DE GARBO (Tommaso del Garbo, d. 1370), son and successor of the foregoing, a most popular practitioner and friend of Petrarch, with whom he kept up an interesting correspondence. His chief work is the unfinished "*Summa Medicinalis*".

TORRIGIANO DI TORRIGIANI (Petrus Turisanus, Trusianus de Turrisoniis), an eminent pupil of Taddeo Alderotti, "*primus inter ceteros Taddei auditores*", taught awhile in Paris, then returned to Bologna and finally became a Carthusian monk, presumably on account of his failure in practice; he died in the middle of the fourteenth century. Of his writings the celebrated commentary on the *Ars Parva* was printed, *Trusiani plusquam Commentum in librum Galieni qui microtechni intitulatur*. This commentary may be looked upon as the paradigm of medical scholasticism, but is not lacking in individual criticism. For instance, he defends against Galen the view that the action of laxatives is brought about, not by direct contact (or mechanically), but indirectly (dynamically), by stimulation of the healing powers of nature. In opposition to Aristotle he assumes the seat of sensation to be in the brain. The same nerve conducts both sensation and movement, the forces of the organ are not independent, but are subordinate powers of the soul.

NICOLAEUS BERTRUCIUS taught medicine in Bologna (where he also had Guy de Chauliac as his pupil), and died of plague in 1347. His historical importance lies in the fact that he continued anatomical dissections after the manner of his master Mondino. He was the author of a handbook of pathology and therapeutics with introductory chapters (*de commendatione artis medicae, de informatione medici, de corpore medicando sine regimine sanitatis et variis medici actibus*). *Collectorium artis medicae tam practicae quam speculativae*; also the works: *In medicinam practicam introductio*; *Methodi cognoscendorum tam particularium quam universalium morborum*; *Diaeta seu regimen sanitatis de rebus non naturalibus et advertendis morbis*. The writings show marked Arabic influence and enjoyed, particularly the first-named, an extended popularity; a noticeable feature is the outstanding dislike of major surgical operations, although their descriptions are included.

PETR. DE TUSSIGNANA (Tussignano, Tussiano).—Under these names are included writings which possibly originate from three different bearers of this name. One of these was the teacher of Guilielmus de Saliceto (therefore in the first half of the thirteenth century) and wrote a *Regimen sanitatis*; another was the author of a treatise upon the thermal springs of Bormio, "*De balneis Burmi apud Vulturenos*", and there are also in existence the writings:

De medicamentorum formulis ; Tabulae super problemata Aristotelis ; Receptae super nono Almansoris ; Consilium pro peste vitanda ; Compositiones et remedia ad plerosque omnes affectus morbosque sanandos. The author of these is probably a third Pietro de Tussignana, who was a famous teacher in Bologna, Pavia and Ferrara and died in 1410.

SCHOOL OF PADUA

GENTILIS FULGINEUS (Gentile da Foligno, de Gentilibus), son of a Bolognese physician, pupil of Taddeo, a fervid admirer of Pietro d' Abano, laboured first in Bologna and Perugia, then (1337-1345) as a teacher in Padua ; he died of the plague in Perugia in 1348. The best known of his works are the " Consilia " ; these contain many excellent observations, although entangled in scholastic subtleties. If the honorific title " Anima Avicennae " is rightly applied to him (and not to an earlier Gentilis da Florentia), the Expositiones in Canonem Avicennae are also his work. Gentilis da Foligno was further the author of a Commentary upon the didactic poem of Aegidius Corbolensis, de urinis, de pulsibus, Introductorium practicae de febribus ; Quaestiones subtilissimae in artem parvam Galeni, de proportionibus medicinarum.

JACOBUS (de Dondis) DONDUS (Giacomo de' Dondi), the " Aggregator ", renowned as a physician, astronomer and mechanic, was born in 1298 in Padua, studied there and practised first in Chioggia, subsequently in his native city ; he probably also taught medicine there. He died in 1359. His chief work is the Aggregator Paduanus de medicinis simplicibus. The saline springs of Albano attracted his attention, and he undertook the extraction of the salt by evaporation in order to apply it medicinally—a project that he sought to justify in his treatises.

JOHANNES (de Dondis) DONDUS (Giovanni de' Dondi), son of the above-named, was born in Chioggia in 1318, enjoyed quite an exceptional fame as physician and astronomer, and was loaded with honours. Amongst others was his nomination by Charles iv. as early as 1349, " propter Summam doctrinam ", as his body-physician. He taught (astronomy, logic, medicine) partly in Padua, partly in Pavia, and died in 1389, leaving a large fortune. On account of an extraordinarily ingenious planetarium which he produced after sixteen years' labour, he and his family received the honorific title of Orologgio. Of his few writings the only one printed is " De fontibus calidis agri Patavini ". His endeavour to obtain knowledge through his own experience independently of authority, taken with his enthusiasm for classical antiquity, won for him the important friendship and esteem of Petrarch. The great despiser of the physicians of his age allowed himself to be treated by Giovanni Dondi for a fever which attacked him in the sixty-sixth year of his age and, partly at least, followed his advice.

MARSILIUS DE SANCTA SOPHIA (Marsilio de S. Sophia), the scion of a famous medical family, taught for the greater part of his life in Padua, later in Pavia and Piacenza, lastly in Bologna (where he died in 1405), and enjoyed great renown as an exponent of Hippocrates, Galen and Avicenna. Of his copious writings have been printed : Luculenta . . . expositio in divi Hippocratis particulam tertiam s. l. et a. ; Questiones to the Aphorisms of Hippocrates ; Tractatus de febribus.

GALEATIUS (Galeazzo) DE S. SOPHIA (d. of plague 1427), nephew of the foregoing, taught in Bologna and Padua, then from 1398 to 1406 in Vienna ; after 1407 again in Padua. Of his writings may be mentioned a work upon the Simplicia, showing signs of independent botanical research, and a Tractatus de febribus.

JACOBUS FOROLIVIENSIS (Giacomo della Torre, of Forlì, d. 1413), one of the most famous commentators of Hippocrates, Galen and Avicenna, taught (philosophy and medicine) in various places in Italy, latterly in Bologna and Padua with exceptional success. Amongst his most important pupils were Ant. Guainerio and Giov. Michael Savonarola. His printed writings are : Expositio in primum Avicennae canonem cum quaestionibus ejusdem ; Expositio super i., ii. et iii. Tegui Galeni, Expositio in aphorismos Hippocratis. The extravagant inscription placed over his tomb began as follows :

Forlivius jacet hic Jacobus, quo clarior alter
 Non fuit Latio et Graecia doctor illo ;
 Alter Aristoteles Italis, Hippocras fuit alter.

NICOLAUS FLORENTINUS (de Falconiis, Niccolò Faleucci, d. ca. 1412), a celebrated Florentine physician, was the author of a comprehensive Repertorium of medicine as a whole, which aimed at including all contemporary knowledge, the "Sermones medicinales". The importance of this colossal work, in every few lines of which the much-read authors were, often verbally, quoted, is not to be underestimated; it provides an unusually complete epitome of mediæval medicine, but little that is original or peculiar to the author.

FRANCE

SURGERY

HENRICUS DE AMONDEVILLA—HENRI DE MONDEVILLE.—The "Surgery" of Henri de Mondeville, commenced in Paris in 1306 and never completed, consisted of: Treatise I., Anatomy; Treatise II., Treatment of wounds, contusions and ulcers. Of Treatise III. (which was to have contained special surgical pathology and treatment, with exception of wounds, ulcers and bone-diseases) only the first and second portions, as well as the introduction to the third, were completed: it contains instruction upon incisions, cauterisation, venesection, etc., amputations, embalming processes, cosmetics, dermatology; doctrine of abscesses and tumours. Treatise IV. is missing (it was to have dealt with fractures and dislocations). Treatise V. deals with *materia medica*.

The anatomy of Henri de Mondeville is, as the author himself states, based for the most part upon Avicenna, but is distinguished by very lucid presentation, mainly directed towards the practical purposes of the surgeon.

Touching upon the necessity of anatomical knowledge for the surgeon, he refers to Galen and Bruno of Longoburgo, but, as may be seen from several quotations, he sets no high standard. The terminology is by no means rich in Arabisms, but includes a considerable number of designations which differ markedly from those of the present day.

In the MSS. of the original text the thirteen illustrations used by Henri de Mondeville for purposes of instruction are not present, but only descriptions of them; the anatomical descriptions were preceded by a picture representing the surgeon as dissector.

In the "Surgery", which commences with the second treatise, the following are described in considerable detail: *Hæmostasis* (tamponage with addition of styptics, cauterisation, ligature, suture), dressing of wounds (as an application strong wine is preferred to other substances, such as "*oleum*", "*unctuosa*", "*pulveres*", although it is not to be introduced "*intra labia vulnery recentium sanguinolentorum*"; tow is better suited to the production of lint dressings than wool), suture of wounds (directions as to needles, thread, stitching, removal of sutures, etc.), care of wounded (subsequent withdrawal of blood by means of leeches or purgatives), extraction of arrows, therapeutics of injuries to the skull, trephining, therapeutics of penetrating thoracic and abdominal wounds (position of patient, suture, reposition of prolapsed parts, etc.), treatment of contusions (venesection, cupping, diet, warm compresses of wine); teaching concerning ulcers (seven varieties, *Ulcus planum, concavum, virulentum, sordidum*, etc.; treatment by means of plasters, salves, powders, incisions, cautery, bandaging); teaching upon poisoned wounds, fistule, cancer (*nullus cancer curatur, nisi totus radicitus extirpatur*), indications for and methods of performing incisions, cauterisation (mostly iron cauteries, of severe kinds), venesection (contraindicated as a rule in children under nine, in feeble old people, anæmic young ones, menstruating women, the dropsical, etc.), cupping (dry and wet, glass-cupping vessels), leeches, amputation, embalming, cosmetics, diseases of the skin (*pruritus et scabies, serpigo et impetigo, morphea et barras aut albarras*, leprosy with its main symptoms: falling of the eyebrows, thickening of the orbital margins, *exophthalmos*, swelling of the nose, livid complexion, *morphea nigra* = dark patches, atrophy of muscles between thumb and forefinger, tense, shiny induration of the skin of the forehead,

loss of sensation in shins and little toes), parasites, burns, warts, abscesses and tumours (ganglion, scrofulous glands, plague buboes, parotitis, abscesses in the neck, mammary abscesses, etc.).

The "Surgery" is, as regards its content, mainly a compilation and abounds in quotations (particularly from Hippocrates, Aristotle, Galen, Rhazes, Avicenna and Theoderic); the form, despite all its discursiveness and scholastic affectation, is admirably suited to didactic purposes. At the present day, however, a special interest attaches to those voluminous extracts which deal with medical education and ethics, and which constitute a veritable mine of medical professional history. The following is a short extract: "The surgeon who wishes to operate secundum artem must first visit places where experienced surgeons frequently perform operations; he must conscientiously watch their operations and stamp them upon his memory; he must then obtain practice by operating with these surgeons' assistance. . . . It is the universal opinion of all authors, practical physicians and surgeons that a surgeon is not fulfilling his duty if he is not familiar with medical art and science, particularly anatomy. . . . A surgeon must be to some degree bold, must not gossip with laymen, he must operate with all care and circumspection and must not undertake risky operations before he has taken every precaution to avoid dangerous accidents. His members must be well-shaped, particularly his hands, his fingers must be long, elegant and lissom, and must not tremble, so that he may, in peace of mind, undertake all operations with success. . . . He should avoid any too dangerous a cure. He should by no means commit himself to completely hopeless operations. The poor he should treat for the love of God; from the well-to-do he should take such fees as he can obtain. He should not be over-confident of his own powers, nor blame others, nor pursue any surgeon with rancour. He should address comforting words to his patient, lend a willing ear to his reasonable requests, if they do not interfere with the treatment of the disease." From the above it may be laid down as certain that greater attainments are demanded of a qualified vulnerary surgeon than of a qualified physician, and that more is demanded of him, viz. manual operations. "Whoso, in any science or in any undertaking, would attain the desired goal, must enter the right portal and tread the appointed path. If he take another way, or behave as though his goal were already attained, he is a thief, a traitor and a deceiver. . . . According to Galen there are two conditions to a cure: firstly, to know wherewith to operate; secondly, to know how to perform the operation therewith. Two roads lead us with certainty to each of these portals, viz. to the first, to theoretical surgery, the highway is the knowledge and thorough assimilation of the theory of wound-treatment, . . . the second road consists in reading this theory and discussing it with colleagues. In order to attain the second portal, that of practical surgery, the first road is that of watching surgeons performing operations. The second road is that the surgeon should long operate with a colleague and subsequently by himself.

"Whosoever, therefore, attains his goal otherwise than as described, or behaves as though he had done so, is to be regarded in the light of a malefactor, as are all unqualified persons, barbers, soothsayers, traders, quacks, alchemists, harlots, procuresses, midwives, baptized Jews, Saracens and all who have squandered their possessions. They vaunt themselves as surgeons, so as thereby to make a living and to hide their misery and need under the cloak of surgery. . . . It is, also, more than astonishing, almost mad, that not only the above-mentioned but even kings, princes, prelates, clergy, dukes, nobles and citizens undertake, in complete ignorance, dangerous cures, particularly in diseases of the eye, the treatment of which is so dangerous, difficult and uncertain that it is difficult to find a surgeon adequately experienced in this branch. Through the mistakes of such people, especially of soothsayers, of clergy, monks and hermits, in whom the populace puts much trust, diseases which are curable become incurable or worse than before. They make the diseased members useless or even kill the patients. Of such holy men it is said by the people that they have an understanding of surgery, and that this is granted them through the grace of the Creator, and whoso does not believe this without further question comes into the category of heretic, unbeliever or evil-doer. . . ."

There is a diverting dissertation upon the theme: "How physicians and surgeons try cunningly to compete one with another in remunerative cases". Amongst other things is said: "When an artful physician is called in to a purely surgical disease, apart from any wound, fracture or dislocation, there will later be difficulty in obtaining surgical aid. The cunning physician, on the other hand, says, 'Sir, it is known that surgeons are arrogant, that they lack reasoned conviction and are thorough ignoramuses. If indeed they know anything at all, they have learnt it from us physicians, and therefore demand a high fee. Wishing you well, altho' I am no surgeon, I will endeavour to render you aid.' If this succeeds and all goes well, this is a most admirable method; but if the outcome is unfavourable, the physician says to the patient, 'Dear Sir, I have already told you that I am no surgeon, altho' I have done what I could, well and skilfully, better than any surgeon. I have lately been overwhelmed with affairs and am no longer able to help you; I beg you to call in a surgeon.' Then the surgeon, anticipating his patient, says, 'I recommend you to consult So-and-so. . . .' He then summons a most incompetent surgeon, who will not discover the mistakes of the physician, so that the latter may continue to direct the surgical treatment as before, and may, if necessary, put the burden of his mistakes upon the surgeon. If, however, the surgeon is summoned in the first instance to treat an internal complaint, he leaves the patient for many reasons without a physician, since the physicians understand nothing except talking to the patient and purge him whether necessary or not, and further because the surgeons daily treat such cases without help from the physicians. . . ."

Of special interest are the very detailed and candid remarks upon the question of fees. Henri de Mondeville says, amongst other things: "The whole wish of the patient, which dominates him completely, is to get cured; once well, he forgets this wish, and does not think of payment; so also the surgeon should think of being paid, and should never take a mere assurance or promise from the patient . . . he should never dine with the patient before receiving payment, such a dinner always diminishes somewhat the honorarium . . . the surgeon should trust no one; the rich may come in the guise of poverty; if they come in better apparel, they make excuses in order to beat down the surgeon's fee. If they find that the surgeon is in the habit of giving assistance to the poor, they say that sympathy is a beautiful thing and that it is the surgeon's duty to help the unfortunate, but never admit that they are also under obligation to do so. Thus I often said to them, 'Pay me for yourself and for three poor people, that I may also cure them.' Then, however, they are silent. I have never seen moderately rich, or still more, eminent men, of whatever profession, who of their own accord paid what was promised without being forced to do so. If one of these rich men can escape, he will pretend that his ailment partly remains, so that the surgeon may not demand anything of him and he may have a reason for not paying."

GUY DE CHAULIAC (Guido, Guidon de Cauliaco, Guigo de Chaulhaco) was the author, in addition to his epoch-making *Chirurgia Magna*, of other vanished treatises upon hernia, cataract, *De conjunctione animantium ad se invicem*, *De conjunctione plantarum ad se invicem*, a *Lapidarius* and *Consilia*; in MS. there is also an astrological work in existence, *Practica astrolabii*.

Of Guy's magnum opus, the *Chirurgia Magna*, there are many MSS. and printed copies in existence, amongst them being translations into French, Provençal, English, German, Italian, Spanish, Catalan, Dutch, Hebrew, in addition to extracts and commentaries. In the preface Guy admits that his work is for the most part a compilation. His debt to literature is proved by the presence of over 3000 quotations from about 100 writers.

The *Chirurgia Magna* is divided into seven treatises.

Treatise I. deals with anatomy, derived for the most part from Galen, Avicenna and Mondino, but based occasionally upon autopsy. Apart from the Arabistic terminology, the description is distinguished by lucidity and is surgically and topographically useful, nearly every description of a region being accompanied by mention of the diseases arising therein (e.g. that of traumatic tetanus with the description of the finger-joints). The

information upon the method of anatomical instruction is of great historical interest. In Guy's opinion models cannot take the place of dissection.

Treatise II. deals with the "Apostemata", under which title not only abscesses, but also tumours of different kinds, œdemas, hernias, etc., are understood. In the treatment of abscesses incision or a "*rupterium de calce et sapone*" were made use of. Anthrax was considered to be *carbunculus malignus*; the treatment was medicinal (external and internal). In gangrene, Guy considered caustics, the actual cautery and finally amputation to be indicated. The treatment of glandular swellings was directed partly towards dispersion or production of supuration, partly towards removal with the knife (warning against extirpation of large tumours in the neck on account of the danger of hæmorrhage or vagus injury). Four varieties of angina (*apostema gutturis*) are distinguished; one of them corresponds to retropharyngeal abscess, another to retro-œsophageal abscess; in addition to numerous internal and external measures, mention is made of a proceeding suitable for deep-seated abscesses, whereby the patient is made to swallow a piece of half-cooked meat fastened to a long thread, this being then pulled up again with some force. In the chapter upon apostemata of the breast, Guy also describes plague buboes in the axilla, upon which follows the celebrated description of the Black Death which commenced to rage in Avignon in 1348.

In the differential diagnosis of ascites ("*apostema aquosum*") from meteorism ("*apostema flatulentum*") use is made both of succussion and percussion; fruitless use of internal remedies may be followed by that of the actual cautery or of "*punctio abdominis*". Hydrocele, known as "*Hernia aquosa*", is recognisable by the "*splendor pellucidus*", i.e. its translucency.

Treatise III. deals with wounds in general and injuries of individual parts. Healing may take place *per primam* or *per secundam intentionem*. Suture of wounds may serve a three-fold purpose, viz. as *Sutura incarnativa*, *suppressoria sanguinis*, *Conservatrix labiorum ad tempus*. *Sutura incarnativa* is employed in all gaping wounds, the edges of which can be approximated. The *Sutura suppressoria sanguinis* finds its place when other sutures cannot be employed "*propter magnum inpetum sanguinis*". The *Sutura conservatrix* is recommended for lacerated wounds with loss of substance, and is not to be so tightly tied. Bandages and dressings are treated in the same subtle manner. Guy was familiar with interference with movement and sensation as a symptom of nerve-lesion. He distinguished injuries of bone from fractures and discarded the employment of vulnerary potions whilst recommending an antiphlogistic diet. Hæmostatic measures included styptics and pressure by means of dressings, suture, severance of vessels, ligature and cauterisation. In the treatment of cranial injuries, Guy, in addition to a critical estimate of the methods of his predecessors, strikes out a line of his own, adopting a different procedure according to whether he has to deal with an incised wound, a lacerated wound or a simple fracture, particular attention being paid not only to general dietetic measures, avoidance of chill and access of air, but also to cleansing of the wound area, removal of loose fragments of bone, free drainage of pus and suitable dressings.

Trephining and the suitable instrumentarium are admirably described. The indications for this operation are held to be compound fractures of considerable extent, compound penetrating fractures of the skull, injury to the dura, purulent and other collections in relation with the dura.

Treatise IV. deals with ulcers, fistulæ, etc., in general and in particular parts of the body. This treatise contains little that is not to be found in Guy's predecessors. Intractable ulcers were treated by application of a plate of lead with a coating of quicksilver; enlargement of fistulous tracts was undertaken by means of gentian-root; deep and long sinuses were opened in their entire length upon a wooden sound. Guy recommended that carcinomata, although he held them to be incurable, should be carefully excised, with subsequent cauterisation.

Treatise V. deals with fractures and dislocations. The description of the production of fractures (including longitudinal fractures), of extension and reduction apparatus, of bandages and complications, is exhaustive. Necessities for treatment of fractures were held to be suitable position, adequate assistance, a sufficient amount of white of egg and rose-oil (with

which the compresses were saturated), sling, three bandages, tow, flat and light splints (of pine-wood, horn, iron, leather), small tubes of sambucus (already recommended by Lanfranchi) for fastening the splints, a cradle or sling for the leg. Guy lays great stress upon extension of the extremities, particularly in the case of fracture of the thigh (most fully described, treated by means of splint and extension). Amongst the five methods of reduction of dislocated shoulder-joint is that already described by Avicenna.

Treatise VI. deals with a series of constitutional diseases, dermatoses and traumatic affections, but, in its chief content, with surgical localised pathology. Interest attaches to the sections upon leprosy (strict isolation, chief remedy vipers' flesh, cooked with distilled water), upon hanging, drowning, burning; upon methods of embalming; upon amputation of gangrenous limbs (use of the saw, cauterisation of the stump with actual cautery or boiling oil).

Surgical localised pathology naturally follows the order *a capite ad calcem*. Dealing with eye-affections, Guy defines cataract as a skin-like spot on the eye in front of the pupil, which interferes with vision, due to an extrinsic moisture which gradually penetrates into the eye and, in consequence of cold, coagulates. Operation (depression) is fairly fully described; the cataract needle should be made of iron. In otology the warning is even to-day worthy of attention, that applications should neither be too hot nor too cold; in examination inspection by the aid of sunlight with simultaneous enlargement of the meatus by means of a speculum is essential. In dentistry the use of forceps is noteworthy. A very voluminous section is devoted to herniology (in contrast with his predecessors Guy does not include scrotal swellings, *e.g.* hydrocele, amongst the hernie). Three varieties of hernia are distinguished: hernia epiploalis, hernia intestinalis and hernia composita ex ambabus. The cause of the rupture is to be sought in a sudden "scissura" or in a gradual "dilatatio". Hernia containing bowel is distinguished from hernia containing omentum by the fact that in the latter reposition occurs without "quadam gurgulatione". According to the case are to be considered from the therapeutic point of view dietetic régime, aperients, enemata, astringent fomentations, rupture-plasters, suspensory bandages; in urgent cases radical operation may be indicated, following upon attempted taxis. Of the methods known in his day, Guy considered four to be reliable. The first consisted in freeing the sac and testicle by incision, drawing up the latter and ligaturing the former as high up as possible, removal of the testicle and cauterisation of the ligatured end of the hernial sac. The second consisted in the use of the actual cautery, with transverse cauterisation of the hernial sac down to the os pubis. The third method was the use of a corrosive, such as arsenic; the fourth the application of a ligature by means of a needle passed under the sac and fastened to a piece of wood laid over it. He himself preferred the use of corrosives.

The diagnosis of vesical calculus is made not only by digital examination per rectum, but also by means of the catheter. Lithotomy is very briefly described on familiar lines (suture of the wound being added), but the operation was performed by peripatetic lithotomists. Before deciding upon operation treatment was attempted by means of internal remedies, baths, compresses, or by means of intra-vesical injections. Although obstetrics was almost exclusively in the hands of the midwives, Guy fills two chapters of the sixth treatise with the subject. The only normal presentation is that by the head; every other is to be converted into a natural one. Dead fetuses are to be expelled by means of sternutatories, etc. (also by dilatation of the os uteri with a form of screw apparatus); finally extraction has to be performed with the hands or the hook and forceps. The line of incision for Cæsarean section is given, viz. on the left side with a razor.

The seventh treatise, the *Antidotarius*, gives an excellent survey of the remedies and formulæ then in use in surgical practice.

SCHOOL OF MONTPELLIER

RAYMUNDUS DE MOLERIIS, Chancellor of Montpellier about 1338, wrote, amongst other things, a treatise "De impedimentis Conceptionis".

GERALDUS DE SOLO, who followed Raymundus as Chancellor of Montpellier, was the author, in addition to a commentary upon the *Isagoge* of Johanius: *Introductorium juvenum sc. de regimine corporis humani*, etc., *Libellus de febribus*, *Commentum super Nono Almansoris c. textu*. *Tractatus de gradibus medicinarum*.

RAYMOND CHALIN DE VINARIO, "Medicus de Montpellier", papal court physician in Avignon, bequeathed a work upon the plague of great importance in the history of the Black Death, with special reference to the year 1382. It is noteworthy that in one place he says, in reference to the spread of the pestilence, *ex neutra causa nec aliunde quam contagione malo transeunte*.

JOHANNES DE TORNAMIRA (Jean de Tournemire, b. 1329) studied in Montpellier and practised partly there and partly in Avignon (as body-physician to the Popes Gregory XI. and Clement VII.). He was one of the most dexterous and learned physicians of his day. Of his writings there were printed: *Clarificatorium juvenum super nono Almansoris cum textu ipsius Rasis*, one of the most popular compendiums of the fourteenth and fifteenth centuries, viz. an elementary text-book for beginners, *Introductorium ad practicam medicinae*, *Tractatus de febribus*.

JOHANNES JACOBUS (about 1364-1384), a contemporary of Johannes de Tornamira, temporarily a chancellor of Montpellier, papal and royal body-physician. His writings follow Gilbert, Gordon, etc., in their contents, but are distinguished by a terse style, free from scholasticism. It is to his credit that he makes much less use of superstitious and disgusting measures than his contemporaries.

ENGLAND

JOHANNES ANGLICUS (John of Gaddesden, ca. 1280-1361), a Fellow of Merton, Prebendary of St. Paul's, probably the first Englishman to be appointed physician at the English Court, published between 1305 and 1317 a *Practica medicinae a capite ad pedem*, commonly known as *Rosa Anglica*. This work represents an imitation of the *Lilium medicinae* of Gordon, but lacks its logical arrangement. It contains many observations doubtless original to the author, but is for the most part demonstrably a compilation and is permeated, in a manner exaggerated even for this age, with scholastic subtlety, every variety of mysticism and conscious chicanery. Thus he pretends to have cured a man, who had been blind for twenty-five years, with an infusion of fennel and parsley in wine. He advises physicians always to demand their fees before commencing a cure. He treated a son of Edward II. with success for smallpox and without leaving scars by enveloping the patient in a red cloth and surrounding the bed entirely with red hangings.

JOHANNES (John) MIRFELD (second half of the fourteenth century) studied medicine in Oxford and then entered the monastery of St. Bartholomew in London and worked at the hospital associated with it; he bequeathed theological and medical writings. To the latter belongs a glossary, *Synonyma Bartholomaei*, consisting of some 750 articles, and the *Breviarium Bartholomaei*; this deals in fifteen sections with fevers, the entire body, the diseases of the head and throat, the chest, abdomen, pelvic organs, extremities, ulcers, wounds and contusions, fractures and dislocations, diseases of joints, *materia medica*, particularly purgatives, and finally with the care of the health.

The *Breviarium* is for the most part a compilation, derived from Macer Floridus, the Salernitans, the surgeons Roger, Lanfranchi, as well as Arnold of Villanova and particularly Gordon, Gilbert Anglicus and Gaddesden, in addition to the ancient and Arabic authors; frequently the author's original observation comes to the fore. The therapy is partly rational, partly mystical. In addition to the above-mentioned medical writings there exists in MS. a short treatise upon prognosis: *Speculum*. In one of Mirfeld's theological works, the *Florarium*, a chapter deals with physicians and their drugs from a deontological standpoint.

SURGERY

JOHN ARDERNE (Ardern, Arden). His writings, illustrated with pictures of instruments, exist for the most part in MS. only and deal largely, though not exclusively, with surgery,

exhibiting a wide personal experience as well as a good knowledge of the literature. Translations into old English are also in existence in MS. In contrast with many other mediæval literary productions the writings of Arderne are noteworthy on account of their richness in clinical histories and largely rational and relatively simple methods of treatment. In intestinal and renal colic he used with success clysters, in which a bladder filled with sea-water served as reservoir; other injections were used by him in bladder and venereal complaints. Every man, he held, should use an enema at least two or three times yearly. His only printed work was his treatise upon fistulae. This work deals with fistulae in general, but chiefly with the origin and treatment of fistula in ano, a subject to which Arderne devoted his special attention. Arderne enumerates a great number of people, many of high standing, whom he had cured of fistula, and states that he had heard of no one, whether in England or abroad, who was really able to cure the complaint. He describes as necessary instruments for the operation a long, slender metal probe for examination named "*Sequere me*", a broad silver needle with curved point, "*acus rostrata*", and the "*tendiculum*" of wood, which served gradually to tighten the ligature, "*frenum cesaris*". In the case of fistulae extending very high up or with patients nervous of operation, ligature took the place of section.

GERMANY

THOMAS, BISHOP OF SAREPTA (1297 to after 1378). Thomas practised until after his election as Bishop in 1352 under his monastic name of *Petrus physicus*, in Breslau and in other parts of the world. He wrote upon venesection and uroscopy and was a strong opponent of the latter and of alchemy.

PRAGUE

MAGISTER GALLUS taught (probably ca. 1350-1360) astronomy and medicine at the University. He was the author of a *Regimen Sanitatis*, containing recommendations upon the quality and quantity of food and drink, upon the ordering of the day and sleep.

MAGISTER SULKO (Meister Sulken) von Hosstka, *artium et medicinarum doctor*, a pupil of the Prague Academy, of which he was Rector in 1413. Two of his "*Consilia*" betray a certain originality and a predilection for dietetic treatment.

SIGISMUNDUS ALBICUS (b. 1347) studied in Prague and taught medicine for some three years in the Academy. He acquired great fame through his medical dexterity and became in 1394 court physician to King Wenceslas, who loaded him with honours and to the end of his life set great store by his advice. Albicus appears to have been an admirable teacher, as far as may be gathered from his writings, which are distinguished for their practical tendencies, pithy expression and sober views. Whilst giving every recognition to the authorities, particularly Arnold de Villanova, he is never lacking in independent judgement. He admitted the value of alchemy to metallurgy, but on the other hand rejected it from the standpoint of medicine, holding the opinion that the original properties of drugs were interfered with by the process of sublimation; he did not oppose astrology so vigorously, even devoting a special chapter to the subject, but the esteem in which he held it may be judged from the fact that he says, in reference to the time at which venesection should be undertaken, "*Sed necessitas frangit legem*", a statement which undermines the entire edifice of medical astrology. In addition to a "*Regimen tempore pestilentiarum*" and a "*Medicinale*", wherein various questions of pathology, dietetics and therapeutics are dealt with, he wrote the "*Tractatus de regimine hominis*"—later known as "*Vetularius*", a work which is advantageously distinguished from many others of this date by rational advice, freedom from bias, and a cheerful outlook.

VIENNA

GALEAZZO DE ST. SOPHIA is supposed to have been summoned from Padua to Vienna, where he became one of the most important teachers and writers and body-physician to Dukes Albrecht IV. and V.

FIFTEENTH CENTURY WRITERS

HUGO SENENSIS of Siena taught in Pavia, Padua and elsewhere, and enjoyed a great name amongst his contemporaries as philosopher as well as physician. He was the author, in addition to commentaries on Hippocrates, Galen and Avicenna, of "*Consilia*", which are of interest on account of their clinical reports.

ANTONIUS CERMISONIUS of Padua, professor in Pavia and in his native town, was the author of "*Consilia medica contra omnes fere aegritudines a capite usque ad pedes*". In the "*Consilia*" formulæ predominate, but there are also many good observations and purposeful therapeutic recommendations therein.

ANTONIUS GAINERIUS (Antonio Guainerio, d. ca. 1445), temporarily professor in Pavia and Chieri, body-physician to several potentates, wrote, amongst other things, a commentary upon the 9th book of Rhazes and a *Practica* under the title "*Opus praeclarum ad praxim non mediocriter necessarium*", consisting of twelve sections. The most noteworthy portion deals with the pathology of the nervous system and gynaecology. When Guaineri enumerates methods of superstition in labour he appears rather to be following the trend of his day than his own convictions.

JOHANNES MICHAEL (Giovanni Michele) SAVONAROLA,¹ probably 1390-1462, professor in Padua, later in Ferrara, was the author of "*Practica canonica de febribus*", "*De arte conficiendi aquam vitae simplicem et compositam*", "*In medicinam practicam introductio*", "*De balneis omnibus Italiae sique orbis*", "*De pulsibus, urinis et egestionibus*", and, in addition, on the model of Avicenna's Canon, of a "*Practica de aegritudinibus a capite ad pedes*", dealing with the entire range of medicine. The work is divided into six treatises. Treatise I. deals with the demeanour of the physician at the bedside, the establishment of anamnesis, and the examination of the patient (inspection of the entire body, the urine, blood, excreta, vomit, etc.), following which the signs of the most important symptom-complexes are enumerated, the varieties of fever, dietary and medicinal therapy, finally prognosis and medical ethics. Treatise II. deals with the "*sex res non naturales*". Treatise III. deals with invalid cooking. Treatise IV. deals with pharmacodynamics. Treatise V. enumerates the medicaments from the three kingdoms and the various methods of administering drugs. Treatise VI. contains in twenty-two sections special pathology and therapeutics. Each section opens with an anatomico-physiological introduction, thereupon follow aetiology, symptomatology, indications and therapeutics; the termination is taken up with various disputed points—"Dubia"—and appropriate Hippocratic aphorisms. Surgery is considered in addition to internal medicine. (Mention is made of a speculum to stretch the nose in operative procedures; of direct laryngoscopy—view of swollen epiglottis by means of forcibly depressing the tongue; description of an instrument resembling a syringotome; mechanical treatment of spinal curvature, etc.) Obstetrics is also dealt with: it is pointed out that in case of difficult labour, narrow hips (*mulieres, quae non sint in suis anclis bene amplae*) should be borne in mind, and the midwife is recommended to inquire as to the course of possible previous labours. It would appear from one passage that at this time the physician had more to do than formerly with practical midwifery, although at first only in difficult cases and amongst the "*dominae magnae*".

JOHANNES DE CONCOREGIO (Giovanni de Concoreggio), b. 1380 in Milan, studied in Bologna (1433), Pavia, Florence, and after 1439 in his native city. He bequeathed a work devoid of any originality, based upon Arabic sources. It is in reality a collection of his writings under the title: *Practica nova medicinae. Lucidarium et flos florum medicinae nuncupata. Summula ejusdem de curis febrium*, etc.

BARTOLOMAEUS (BARTOLOMEO) MONTAGUANA, professor in Padua, d. ca. 1460. His *Consilia*, which were long highly esteemed, constitute a medical clinical history arranged from the following point of view: Diet, diseases of the brain, of nerves, eyes, ears, nose, mouth, larynx, lungs, heart, breasts, stomach, liver, spleen, intestines, anus, kidneys, male and

¹ Grandfather of the celebrated Girolamo Savonarola, who was burnt as a heretic in 1498.

female organs of generation, diseases of the spine and extremities, dyscrasia, fevers, diseases of the skin, leprosy. In the section upon leprosy the tubercular form is no longer included.

JOHANNES ARCULANUS (Herculanus, Giovanni Arcolano, d'Arcoli) of Verona is supposed to have taught first (1412-1427) in Bologna, then in Padua and Ferrara (d. 1460, or possibly 1484). He wrote *Expositio in primam fen quarti canonis Avicennae* and *Practica medica s. Expositio in nonum librum Almansoris*. The latter writing is in form of a commentary, but is advantageously distinguished from others by its lack of prolixity and fondness for quotation, and contains not a few original observations upon special pathology and therapeutics. An excellent account is given of the symptomatology of delirium tremens; in the surgical section, which is made clearer by illustrations of instruments, there are many interesting passages illustrative of the advance in technique (*e.g.* removal of water from the auditory meatus by means of a species of syringe; filling hollow teeth with gold-foil; use of catheters of malleable material in various urethral disorders).

CHRISTOPHORUS BARZIZUS (de Barziziis, Cristoforo Barziza), "novello Ippocrate", "Monarca della Professione", was professor in Padua (1434 till at least 1440), and bequeathed an "Introductorium sive janua ad omne practicum medicinae" and a general pathology and therapeutics, *De febrium cognitione et cura liber*.

JOHANNES MATTHEUS DE FERRARIIS (Ferrarius, de Gradi or Gradibus (Giamatteo Ferrari da Grado), d. 1472, laboured with great success as professor of medicine in Pavia, as body-physician at the court of Francesco Sforza and as a practitioner, much respected and consulted by the most eminent. Writings: *Practica vel commentarius textualis cum ampliationibus et additionibus materialium in nonum Rhazis ad Almansorem*; *Expositiones super vigesimam secundam fen tertiae canonis Avicennae*; *Consiliorum secundum viam Avicennae ordinatorum utile repertorium*.

Both *Practica* and *Consilia* (which are not without interest in their bearings on contemporary history) contain many original observations and directions based upon personal judgement, *e.g.* dietetic rules for students and travellers; cases of writer's cramp; facial paralysis; salivation; hæmoptysis with dysmenorrhœa; sterility due to malposition of the uterus; recommendation of pessaries in the treatment of uterine prolapse, of trusses with flat and square pads in treatment of hernia, etc. The particular attention paid to anatomy is noteworthy.

MARCUS GATENARIA (Marco Gatenaria, Gattinaria, Gattinara), d. 1496, of Vercelli, practised in Milan and Pavia (in the latter place as professor). Many excellent observations and important surgical recommendations occur in his writing "*De curis aegritudinum particularium sive expositio in nonum Almansoris*", which was long popular, although following rigidly upon Arabic lines and for the most part a compilation and commentary. In the forty-seventh chapter occurs, with corresponding woodcut, the description of an enema syringe (following Avicenna). The syringe consists of a bladder, to which a cannula is attached, which is divided lengthwise into two divisions, an upper one of wider bore, with an opening at the free end, by means of which the injection is made into the upper part of the bowel, and a lower narrower division, with a second opening further back, close to the attachment to the bladder, through which air present in the bowel or introduced into it may escape.

BAVERIUS DE BAVERIIS of Imola, body-physician to Nicholas v., professor in Bologna as late as 1480, published *Consilia medicinalia sive de morb. curat. liber.*, which are remarkable for individual clinical communications (*e.g.* caries of the petrous bone; differential diagnosis between catalepsy, hysteria, epilepsy and syncope; case of hemiplegia in a pregnant woman with spinal curvature; case of paralysis with disturbance of speech and memory; vertigo of gastric origin; treatment of chlorosis with iron).

SURGERY

PETRUS DE ARGELATA (Pietro d'Argellata, P. de la Cerlata, Largelata, etc.), d. 1423. Professor in Bologna, one of the most famous surgeons of the early fifteenth century, he

was the author of *De chirurgia libri VI.*, wherein the earlier literature is made careful use of, particularly Avicenna amongst the Arabs, and of the Western authors particularly William of Saliceto, Lanfranchi and Guy de Chauliac, whilst original observations are by no means wanting. Pietro d' Argellata describes the most usual operations, but shows himself on the whole little inclined towards major operative undertakings. His case-records are worthy of recognition, particularly in the section dealing with wound-treatment, as is also the frankness with which he acknowledges his mistakes. In Book V. gynaecology and obstetrics are dealt with—noteworthy points are the incision in the linea alba in post-mortem Cæsarean section; procedure for extraction by hooking the finger into the perforation opening; performance of embryotomy by the surgeon.

LEONARDUS BERTAPALIA (Leonardo da Bertapaglia, Bertipalia, Bertopalia, etc.—d. 1460) was professor in Padua, was the author of a *Chirurgia* in seven parts. The work is permeated by the Arab spirit; besides Hippocrates and Galen few besides Arabic writers are quoted; medicinal treatment preponderates over actual surgical measures and fantastic conceptions largely prevail over unbiassed observation.

FRANCE

MONTPELLIER

VALESCUS (Valascus, Balescus, Balescon) DE TARANTA, a Portuguese by birth, received his education in Montpellier, and was, towards the end of the fourteenth and the beginning of the fifteenth centuries, one of the foremost teachers; he enjoyed the reputation of an admirable practitioner. He published in 1401 a *Tractatus de epidemia et peste*, and a work, embracing all medicine, and highly thought of as late as the seventeenth century, entitled: *Philonium pharmaceuticum et chirurgicum de medendis omnibus cum internis tum externis humani corporis affectibus*. Valescus, as he himself says in the preface, divided the work into seven parts on account of the sanctity of the number seven. There is evidence of a certain endeavour towards unbiassed observation. According to the traditional arrangement a capite ad calcem the diseases are considered of head, face, respiratory system, intestinal tract, liver, spleen, kidneys and bladder, sexual organs, fevers, epidemic diseases, and finally, in a separate *Tractatus chirurgiae*, the teaching on abscesses, ulcers, tumours, wounds and skin diseases are dealt with. The literature, including that of the day, is made good use of.

PARIS

JACOBUS DE PARTIBUS (Jacques Despars of Tournay, d. 1457, according to others 1465 or even later), the chief French representative of the Arabistic school, body-physician to King Charles VII. and Philip the Good Duke of Burgundy, taught at the High School of Paris, which he endowed with a large portion of his fortune. It was chiefly thanks to him the medical faculty of Paris finally came into possession of a home of its own in the Rue de la Bûcherie. He represented the school upon the Council of Constance. Having drawn upon himself the anger of the bath guilds owing to his criticism of common baths and through his proposal to close the bathing establishments in time of plague, feeling that his life was no longer secure, he returned to his native city. Despars laboured for twenty years at a great commentary upon Avicenna: *Explanatio in Avicennam*, in which he took his stand upon the Greek and Arabic writings, professedly in the originals and not through translations. A noteworthy observation therein is upon typhus. In addition to this commentary he wrote: *Glossa interlinearis in praepticam Alexandri Tralliani*, *Collecta in medicina pro anathomia*, *Expositio super capitulis . . . primi Avicennae*, *Summula per alphabetum super plurimis remediis ex ipsius Mesuae libris excerptis*, *Inventarium collectorium receptorum omnium medicaminum*, etc.

LITERATURE OF THE SPECIAL BRANCHES¹*Ophthalmology*

GILLIBERTUS, chancellor of Montpellier about 1250. Experimenta.

BARNABUS DE REGGIO. Libellus de conservanda sanitate oculorum, published in the year 1340.

JOHANNES DE CASSO. Tractatus de conservatione sanitatis oculorum, published in the year 1346.

Diseases of Children

PAULUS BAGELLARDUS de Flumine (Paolo Bagellardo), born at Fiume, first "Extraordinarius" in practical medicine, later (ca. 1472) "Ordinarius" in theoretical medicine in the University of Padua, published Libellus de egritudinibus infantium, upon care of nurslings, diseases of children and their treatment, mainly following the traditional writings of Rhazes.

Materia Medica and Pharmacy

CHRISTOPHORUS DE HONESTIS, Expositio super antidotarium Mesuae cum tractatu de aqua hordei et modo faciendi ptisanam.

SALADINUS DE ASCULO (Esculo), ca. middle of fifteenth century, body-physician to Giovanni Antonio di Balso Orsino, Prince of Tarento, published a Compendium aromatorium, for the use of pharmacists. This first pharmacopœia in the modern sense was employed for centuries by apothecaries and served later as a model for all pharmaceutical text-books. It consisted of eight sections. The first dealt with the intellectual and moral demands made upon the pharmacist. He should possess the following works: De simplicibus Avicennae et Serapionis, De synonymis, Simonis Jannensis, Liber servitoris (of Albu Rasim), Mesue, Johannes Damascenus, Antidotarium Nicolai or Circa instans Platorii, De simplicibus of Dioscurides and also Macer Floridus. The second section explains the nomenclature of compounded remedies, the third deals with weights, the fourth with preparation of recipes, wherein warning is given against the wilful use of substitutions. In the sixth section rules are laid down for the collection of vegetable remedies and for the preservation of simple and compound medicaments. The seventh section deals with the vessels employed for keeping drugs; the eighth section is a Series medicaminum in qualibet aromataria vel apoteca.

QUIRICUS DE AUGUSTIS of Tortona, physician in Vercelli. His Lumen Apothecariorum deals in fifteen sections with everything needful for apothecaries.

JOH. JAC. DE MANLIIS DE BOSCHO. Luminare majus super descriptiones antidotarii et practicae divi Johannis Mesue.

Toxicology

SAUTER DE ARDOYNIS (Sauter Ardoyno) of Pesaro, physician in Venice, published in 1426 a work De venenis, which, though throughout partaking of the character of a compilation, is nevertheless of great historical interest.

Balneology

MATTH. DE BANDINELLIS. Tractatus de balneis Luccensibus. 1489.

UGOLINUS DE MONTECATINO. Tractat. de balnearum Italiae proprietatibus et viribus.

Dietetics

BENEDICTUS A NURSIA. De conservatione sanitatis.

Medical Astrology

JOHANNES GANIVETUS (Jean Ganivet, a Minorite father, professor of theology at Vienne in the Dauphiné). His work Amicus medicorum, completed in 1431, was long held in high

¹ Only those authors are here considered of whom no mention has previously been made. Writings upon plague are excepted.

esteem and was supposed to contain all that was necessary for a physician concerning astronomy and astrology.

LITERATURE IN THE VERNACULAR

ITALIAN

MAESTRO GREGORIO. Fiori di medicina di Maestro G. deals in twelve chapters with the most important matters of diet.

ALDOBRANDINO DA SIENA. Le quattro stagione e come l' uomo si deve guardare il corpo ciasceduno tempo dell' anno.

UGOLINO DA MONTECATINI. Trattato de' bagni termali d' Italia. Trattato dei cauterii.

UGO BENZI. Trattato utilissimo circa lo regimento e la conservazione della sanitate.

MICHELE SAVONAROLA. Libreto de tutte che le cose se manzano communamente piu che comune . . . e le regole per conservare la sanità de li corpi humani con dubii notabilissimi.

PROVENÇAL

A Basle MS. contains in succession a Surgery by Stephanus Aldebaldis, a Surgery of mayestre roger (Roger of Salerno), an anonymous urinary treatise (written ca. 1300), to which is attached a Dietetics, an "Anothomya", written ca. 1250, a free version of the Anatomia of Richardus Salernitanus, with excerpts from the Anatomia porci of the younger Kophon the Salernitan, and a translation of the treatise on diseases of the eye of Benvenutus Graphæus. The Provençal treatise upon anatomy contains five illustrations which represent the osseous system (with explanatory text), the venous system with the viscera of the three cavities of the body, the female organs of generation, the male organs of generation, the arterial system, with the breasts and abdominal viscera.

GERMAN

(a) MIDDLE HIGH GERMAN

PHARMACOPEIAE. "Das arzinbuoch Ypocratis." "Practica" of "Meister Bartholomäus" of Salerno, etc.

"Meinanes Naturlehre" (thirteenth century). The dietetic directions were based upon the Regimen sanit. Salernitanum.

"VOLMARS STEINBUCH" (ca. 1250) in verse.

KUNRAT VON MEGENBERG (ca. 1309-1374). "Puch der natur" (ca. 1350). The author, a liberally minded cleric, taught for eight years in Paris and, on his return to Germany, became director of the town-school of Vienna, taking up later permanent residence in Regensburg. Megenberg's "Book of Nature" follows in its contents the Liber de naturis rerum of Thomas of Cantimpré, but appears to be based, not upon the original of this work, but upon a Latin translation. "Regimen sanitatis." Contains dietetic directions upon demeanour at different times of year and in individual months, influence of the elements and temperaments upon man, qualities of different foods and drinks, regulation of sleep, aperients, baths, blood-letting, emetics, clysters; mode of life at times of plague; directions as to welfare of head, brain and eyes. At a later period was added to this a symptomatological addendum with short prophylactic and therapeutic recommendations and recipes. It is no more than a compilation, the unknown author frequently quoting Aristotle, Hippocrates, Galen and the Arabs.

HEINRICH COUFFENBERG. "Supervision of the Body." Dietetic didactic poem of 1429. The eighty-three woodcuts in this work are of the greatest historical interest.

ORTOLFF VON BAYRLAND (physician in Würzburg at the latest in the first decade of the fifteenth century): pharmacopeia. Contents: the four elements, signs of health, rules for the preservation of health (avoidance of the sick on account of the danger of infection), use of drugs, evacuation of the bowels, accession of disease, care of nurslings, urinary and

pulse observations, special pathology and therapy of internal diseases, a *capite ad calcem*, a short surgical chapter, dietetic regime in individual months, the influence of different foods upon the action of the bowels, treacle, foot-baths, distension of the stomach, shortness of breath, ointment of aloes.

BARTOLOMAEUS METLINGER (ca. middle of fifteenth century), physician in Augsburg, was the author of "Ein Regiment wie man junge kinder halten sol von mutterleyb bis zu sibem jaren, mit essen, trinken, paden und in allen kranckheyten die in zu sten mögen". This little book, doubtless derived from hand-written copies, in which are quoted Hippocrates (Aphorisms), Galen (de regimine sanit.), Rhazes (Continens), Avicenna (Canon), Averroes (Colliget), Constantinus (Pantegni) and Avenzoar, is divided into four chapters, of which the two first deal with the diet and care of children, the second with the diseases of children, the fourth with their education.

Chapter I. : general rules of health for the newly-born, until they learn to walk and speak, cleansing the mouth, bathing the new-born, dusting the navel with desiccating powder, care of navel, sleeping with head elevated ; upon the method of lifting, stroking and wrapping of the infant, what may be gathered from their crying.

Chapter II. : suckling, choice of wet-nurse, weaning, testing the milk of nurses, nourishment of nurses.

Chapter III. : Following the introductory statement that in the case of a sick nursing the nurse herself must be included in the cure, the following diseases are described : eruption of the head, hydrocephalus, meningitis (?), insomnia, cramp, paralysis, otorrhea, inflammation of the eyes, squint, teething, swelling of the throat, affections of the oral mucous membrane, enlargement of the breasts, disorders of digestion, jaundice, diarrhoea, constipation, prolapse of rectum, worms and colic, umbilical and other herniæ, urinary calculus, ulcers of the skin, fevers, erysipelas, measles and chicken-pox. In therapeutics the author relies mainly upon personal experience.

Chapter IV. : Directions as to how children should be held in learning to walk, upon bodily and moral education up to the seventh year (eating, drinking, bathing, exercise, commencement of instruction in the sixth year) ; wine-drinking permitted to girls after the twelfth, boys after the fourteenth year.

MICHAEL PUFF OF SCHRICK (ca. 1400-1473), professor at the Vienna University, published in 1455 a work (with a revised edition by the author in 1466) upon the use of distilled waters—from eighty plants—and of distilled spirits.

HEINRICH VON PFOLSPENNDT. "Buch der Bündth-Erznei", published 1460. The work begins with a few deontological considerations, dealing chiefly with temperance and cleanliness ; an important piece of advice is that the vulnerary surgeon, dealing with difficult cases, which he is not himself capable of handling, should direct the patient to other, more experienced, masters. Wounds (in the examination of which the probe is made use of) may be divided into recent and old (infected) ; the former can usually be made to heal only by way of suppuration (application of turpentine, oil of roses, wound-plasters spread upon tow or flax and composed of honey, meal and bole) ; the latter require stimulating, desiccant and caustic remedies, of which a number are enumerated (*e.g.* alum, verdigris, caustic soda). Although Pfolspennndt shows little inclination in general towards the use of immediate suture in the closure of wounds, he gives clear instructions in the methods of its performance. *e.g.* suture of the scalp (with a green silk thread, left *in situ* for seven days). In the arrest of hæmorrhage tampons were employed (of cotton wool), impregnated with styptics ; there is not a single mention of ligature. As traumatic diseases of wounds are included "wilde Fewer" (erysipelas) and "Gliedwasser" (watery discharge, suppuration). Vulnerary potions are naturally considered indispensable necessities. The most detailed description is given of the treatment of penetrating abdominal wounds (particularly those caused by arrows). In relation to these is discussed enlargement of the wound and immediate suture, and in particular the reposition of prolapsed intestines ; a ruptured coil of intestines should be removed by section and replaced by a silver cannula ; internal hæmorrhage (on account of

danger of clotting) is to be treated by appropriate position of the patient. The directions concerning extraction of arrows are very minute; on the other hand, mention is only once made, and that casually, of shot-wounds. Setting of fractures (following reposition) is undertaken by means of a "leg-plaster" with appropriate splints of wood, felt and paste-board; in compound fractures the seat of fracture must be left exposed. In fracture of the hip use is made of a wooden fracture-box on account of the danger of shortening; mechanical treatment is employed to obviate distortion. Directions as to reduction of dislocations rest upon little anatomical foundation, and are almost wholly empirical; treatment of herniæ is scanty (rest, reposition, dietetic measures, etc.); radical operation is not mentioned. Apart from the above-mentioned diseases cursory mention is made to diseases of teeth and mouth, gout, dysentery, thread-worms, dysuria, condylomata, plague buboes, etc.

The great importance of the work, however, lies in the fact that it contains the first description of rhino-plasty, carefully guarded as a craft secret. The author, as he admits, learnt it from an Italian and had only imparted it to two members of the order. Noteworthy also is the description of hare-lip operation and directions of anæsthetisation (narcotic sponge steeped in juice of black poppy, henbane seeds, leaves of mandragora, unripe mulberries, hemlock root, ivy, lactuca seeds, mezeoreon).

(b) MIDDLE LOW GERMAN

PRACTICA of "MEISTER BARTOLOMAEUS" of Salerno.

EVERHARD VON WAMPEN of Pomerania published in 1325 at the Swedish Court "*Spiegel der Naturen*" (Mirror of Nature), a didactic poem containing a popular representation of humoral pathology with reference to seasons, signs of the Zodiac, planets, etc., with dietary founded upon these.

DAS (UTRECHTER) MITTELNIEDERDEUTSCHE ARZNEIBUCH (ca. 1400).

DAS GROSSE WOLFFENBÜTTELER ARZNEIBUCH.

MIDDLE DUTCH

JEHAN YPERMAN. *Chirurgie*.

The "*Chirurgie*" rests upon intimate knowledge of the literature¹ and is provided with anatomical figures (*e.g.* skull sutures) and representations of instruments. Originally published in Latin, it contains many original observations and shows the author to have been a bold and skilful operator. The work begins with a pious introduction, a definition of surgery and anatomy of the head, together with traditional physiologico-pathological comments, following which a surgical deontology, wherein, in addition to bodily and moral properties, knowledge of grammar, logic, rhetoric and ethics is demanded. The following points may be noted in the wider scope of the work, which treats of the doctrine of wound treatment in general and of arrest of hæmorrhage, then of surgical affections arranged a capite ad calcem. Wounds (in suitable cases) are sutured with a straight needle and waxed thread; a plug is made use of to assist drainage of pus. Yperman distinguishes between arterial and venous hæmorrhages; in severe bleeding use is made of styptics, compression, cautery, ligature and acupressure (possibly also torsion) of vessels. Amongst cranial injuries (detailed description of trephining) are included contusions of the cranial vault without external wounds. Partly severed ears are stitched in place. Detailed descriptions are given of injuries through missiles (arrows), with regard to the method of extraction; a special vulnerary potion was administered to the wounded. Cysts should be extirpated or extracted with a blunt hook. Amongst diseases of the nose mention is made of polypi, epistaxis,

¹ Twenty-five authors are quoted, amongst which most frequently of the ancients, Galen, of the Arabs, Avicenna, of the Westerns, Lanfranchi. Yperman adheres most closely to the last, who was his teacher. In addition to those well known, there occur amongst the authors quoted several names previously unfamiliar, *e.g.* William of Congeinnu or "Anceel van Geneven", who in opposition to all other surgeons made use of stimulating diet for the wounded; Wilhelm van Mediecke, who prescribed mercurial ointment.

ozæna ; of diseases of the mouth, ranula, cancer, ulcers of the tongue, scurvy, fissures of the labial mucous membrane ; of diseases of the ear, foreign bodies, otorrhœa and worms in the ear. There is an exhaustive section dealing with injuries, shot-wounds, abscesses and glandular swellings of the neck. In this connection there is a description of a case in which feeding was carried on through a silver tube inserted deeply into the mouth. Skin diseases are exhaustively dealt with ; amongst the diagnostic signs of leprosy are given anesthesia of the skin, non-adherence of water to the skin and examination of the blood (three grains of salt laid on drawn blood do not " melt " in the case of lepers). Following the sections upon infected wounds, buboes, fistulæ, erysipelas, abscesses and burns, comes a description of visceral injuries and herniæ. To assist reposition of prolapsed abdominal organs, the wounds should be enlarged ; cure of herniæ is to be attempted by rest in a supine position for six weeks, special diet, plasters, etc. Under affections of the penis mention is made of simple and malignant ulcers, in the treatment of which powders, injections, cauterisations, etc., play an important part. Umbilical hernia should be radically treated by means of acupressure. There is no mention of surgical measures in the treatment of hæmorrhoids. Prolapse of the rectum is to be treated with astringents. The treatise upon internal medicine represents a compendium rather intended for beginners and takes chiefly into consideration the therapeutic aspect (venesection, purgatives, baths, fumigations, inunctions, compresses, etc.) ; in this work, too, Yperman shows himself as a physician of independent judgement and ripe experience.

MIDDLE ENGLISH

MIDDLE ENGLISH RECIPES OF THE FOURTEENTH CENTURY, ca. 1400.

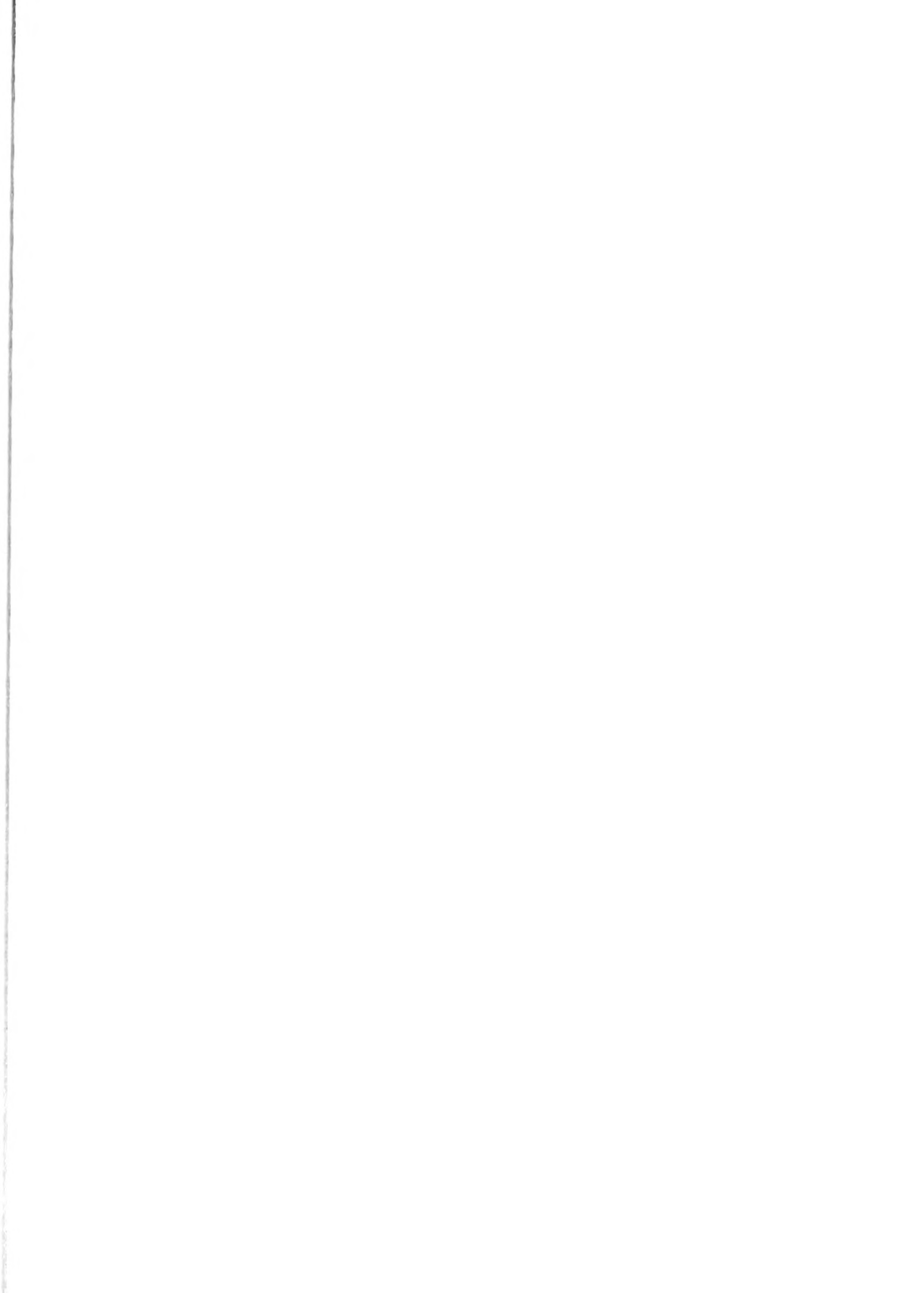
GAELIC

MEDDYGON MYDDFAI, the physicians of Myddvai or the medical practice of the celebrated Rhiwallon and his sons, of Myddvai in Caermarthenshire.

OLD DANISH, NORWEGIAN, SWEDISH

HENRIK HARPESTRENG, d. 1244.

UR LÆKNINGBÓK (thirteenth century), Norwegian, the oldest fragment of an Icelandic pharmacopœia.



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